

**TASMANIAN TIN PROSPECTS**

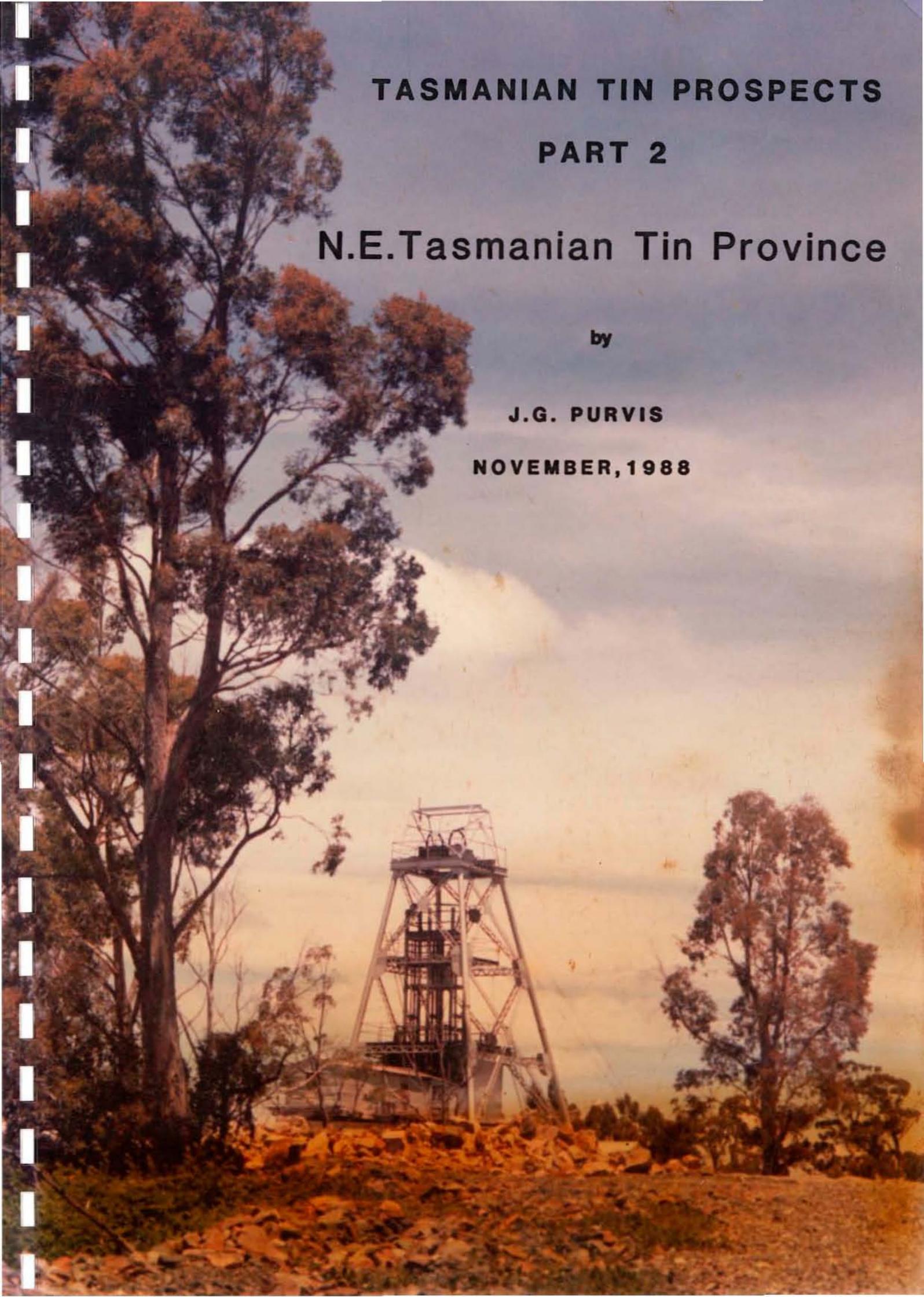
**PART 2**

**N.E.Tasmanian Tin Province**

by

**J.G. PURVIS**

**NOVEMBER, 1988**



TASMANIAN TIN PROSPECTS

PART 2 - N.E. TASMANIAN TIN PROVINCE

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Submitted to:  
D. B. Wallace

Cover: Headframe of Aberfoyle's Storeys Creek Mine.

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1. SUMMARY

The NE Tasmanian Tin Province has produced approximately 70,000 tonnes of tin - 46,500t from alluvials and 23,500t from hard-rock deposits. There is no current production.

In-situ identified resources, of varying reliability, total 39,500 tonnes of tin. Total known potential resources (including the identified resources) are put at 97,000 tonnes of tin. Although all identified and potential resources are held by various Companies under Retention Licences or EL's, there is little activity at the present time.

The largest potential resource and what seems to be the best prospect, is at Aberfoyle (Rossarden) where large-scale open-cut bulk mining of the mineralised Aberfoyle and Lutwyche vein swarms appears feasible. The total potential resource here is estimated at a minimum of 40,000 tonnes of contained tin (+WO<sub>3</sub>), with an indicated grade up to 0.25% Sn + WO<sub>3</sub> and accessory Cu, Zn and Ag.

Another large open-cuttable resource is at the Great Pyramid deposit where although the in-situ identified resource is only 3.13 million tonnes @ 0.22% Sn (6,900t Sn), the potential resource has been estimated by Aberfoyle (Young 1982) at up to 12 million tonnes @ 0.25% Sn (30,000 tonnes of contained tin). This grade is understated by an unknown amount due to core losses during drilling and the true grade may be in excess of 0.3% Sn.

Over 10,000 tonnes of tin is contained in identified alluvial resources, but no deposits individually exceed 2,000t Sn. A dredgeable potential resource of 76.5 million m<sup>3</sup> grading 103g Sn/m<sup>3</sup> (7880t of contained tin), is estimated by Santos to exist in the Great Northern Plain area of the Ringarooma valley. However, there are environmental and mineral tenure problems associated with this area and the offshore deposit located on the floor of Ringarooma Bay appears to be more attractive. Here, the potential resource is estimated by CRA at a minimum 21 million m<sup>3</sup> grading 175g Sn/m<sup>3</sup> (3700t Sn), but the deposit has not been fully defined and may be much larger.

Other in-situ identified resources include the Anchor deposit at 3.51 million tonnes @ 0.28% Sn (9700t Sn), including 634,000 tonnes @ 0.49% Sn (Renison figures). A small mining operation is planned at the Anchor by Spectrum Resources Ltd. commencing in early 1989. Spectrum have also recently taken up the Royal George deposit where there is an identified resource of 590,000 tonnes grading 0.41% Sn (CRA figures). Spectrum appear likely to try and acquire more tin properties in NE Tasmania.

The stanniferous alkali-granite intrusion known as the Mt. Paris Mass has excellent grassroots tin potential. Although the numerous workings on the mass have produced little tin, eroded mineralisation has contributed over 27,000t Sn to the alluvial deposits in the Ringarooma system, making the Mt. Paris Mass the most productive tinfield in NE Tasmania. This fact has apparently not been appreciated by explorers to date - the area is under-explored and is not held under exploration title at the present time. The mineralised roof zone of the granite is

only partially exposed and eroded, with the southern half of the intrusion still covered by Paleozoic sediments. The inference from the massive amounts of tin shed from the eroded northern portion is that extensive tin mineralisation should be present beneath this cover. Areas of thin cover are therefore prospective.

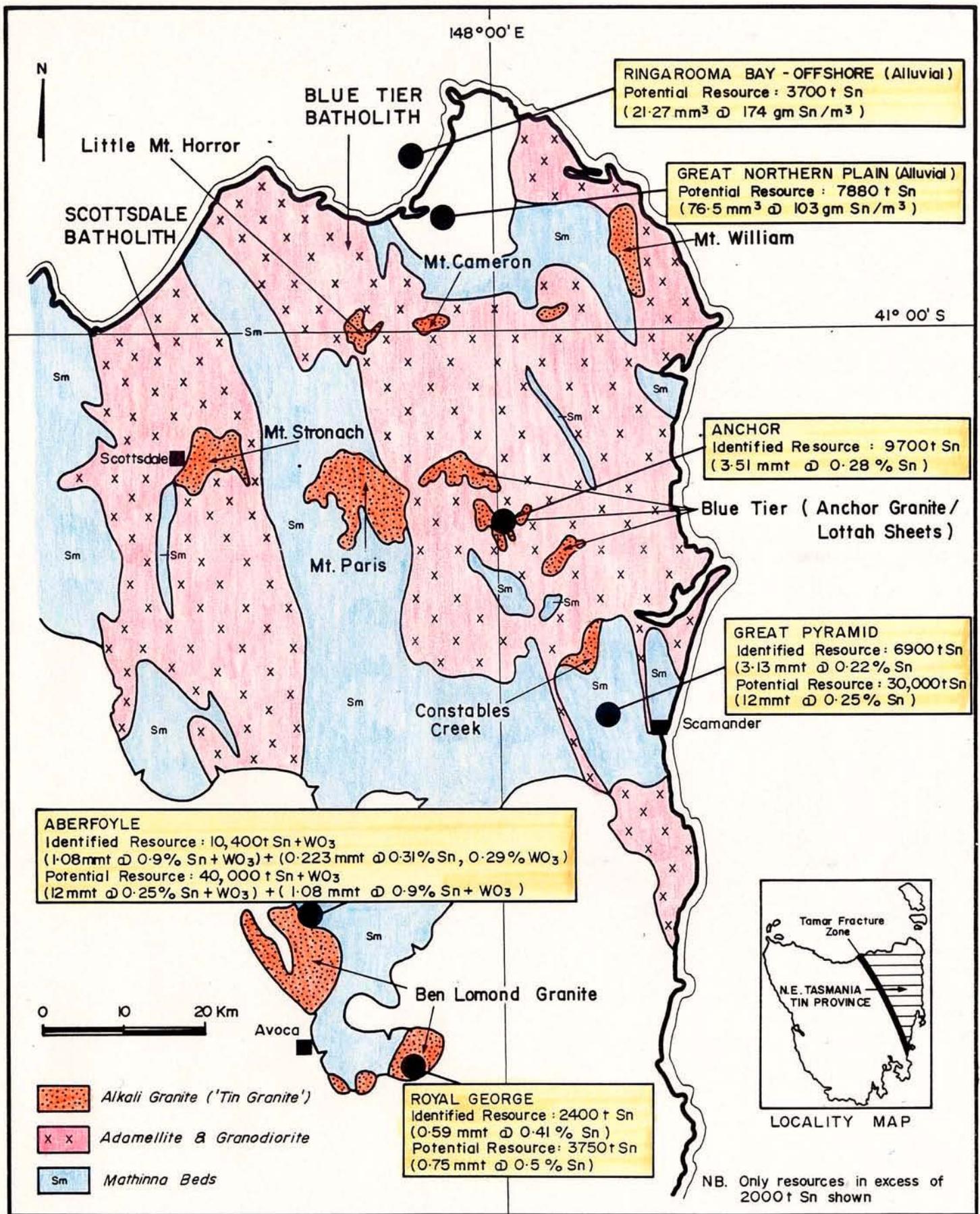
Tin mineralisation in NE Tasmania is genetically related to Devonian alkali-granite intrusions. Deposits are of three principal types :

1. Disseminated cassiterite in endogranitic greisen sheets and veins, associated with the roof zones of the alkali-granites.
2. Cassiterite in vein and fracture swarms in the Siluro-Devonian Mathinna Beds sediments overlying the granites.
3. Alluvials derived from the erosion of the above.

The tin mineralisation in types 1 and 2 is often accompanied by tungsten (generally wolframite) and sulphides of Cu, Zn, Ag and As. Gangue minerals include quartz, topaz and fluorite.

The Mathinna Beds appear totally devoid of carbonates and there is no known skarn-type tin mineralisation in NE Tasmania. There is some development of disseminated magnetite in the Mathinna Beds at the Great Pyramid deposit, which although minor is sufficient to cause a detectable magnetic anomaly.

All deposit types are characterised by low overall tin grades, which makes them very dependent on the tin price for viability. This feature is to some extent offset by the simple metallurgy and bulk open-cut mining possibilities of most of the deposits.



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**NORTH EAST TASMANIA  
PRE-CARBONIFEROUS GEOLOGY &  
KNOWN TIN POTENTIAL**

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 & de Graaf, 1983  
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TABLE 1

PRODUCTION FROM N.E. TASMANIAN TIN PROVINCE  
(tonnes of tin metal)

	<u>HARD ROCK</u>	<u>ALLUVIAL</u>	<u>TOTAL</u>
<u>Blue Tier Tinfield</u>			3,260
a) Anchor deposit	2,500		
b) Others	600	160	
<u>Royal George Deposit</u>	1,000		1,000
<u>Great Pyramid Deposit</u>	340		340
<u>Rossarden Area</u>			18,670
a) Aberfoyle/Storeys Creek Deposits	17,800		
b) Others	870		
<u>Mt. Paris Tinfield</u>	500		500
<u>N.E. Alluvial Deposits</u>			46,500
a) Ringarooma River system		44,500	
b) St. Helens area		2,000	
Totals	23,610	46,660	70,270

(Various Sources)

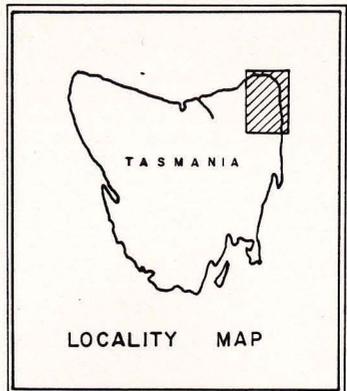
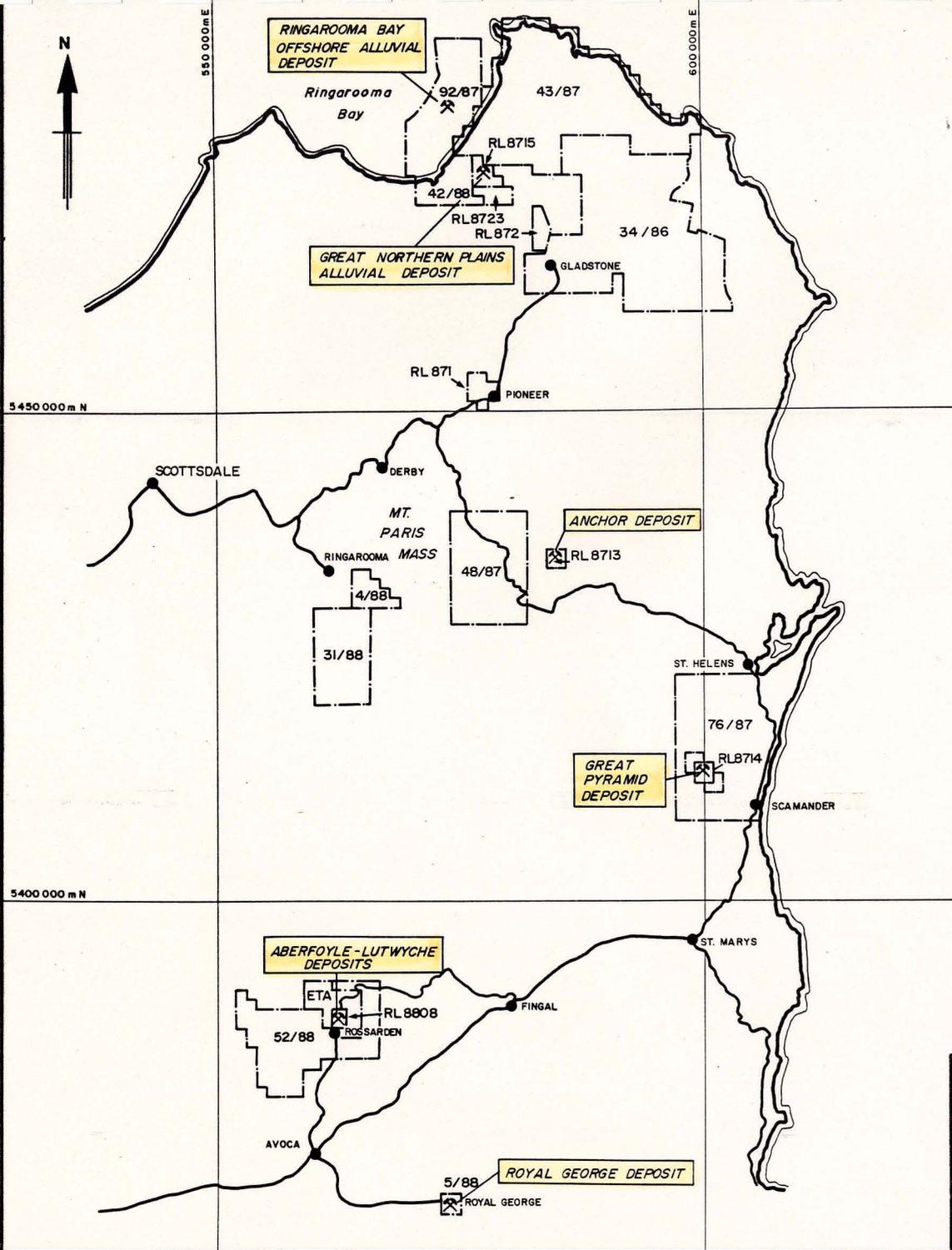
TABLE 2

KNOWN RESOURCES OF THE N.E. TASMANIAN TIN PROVINCE  
(tonnes of contained tin metal)

	<u>HARD ROCK</u>		<u>ALLUVIAL</u>	
	<u>Identified Resources</u>	<u>Total Identified + Potential Resources</u>	<u>Identified Resources</u>	<u>Total Identified + Potential Resources</u>
<u>Blue Tier Tinfield</u>				
a) Anchor deposit	9,700	9,700		
<u>Royal George Deposit</u>	2,400	3,750		
<u>Great Pyramid Deposit</u>	6,900	30,000		
<u>Rossarden Area</u>				
a) Aberfoyle/Lutwyche Deposits	10,400*	40,000*		
<u>Mt. Paris Tinfield</u>	Nil	Nil		
<u>N.E. Alluvial Deposits</u>				
a) Great Northern Plain			4,190	7,880
b) Delta/Dugards			110	1,930
c) Ringarooma Bay-offshore			-	3,725
d) Arba Deep Lead			1,910	-
e) Cascade Deep Lead			1,235	-
f) Pioneer Deep Lead			1,000	-
g) Endurance Deep Lead			1,120	-
h) Monarch Deep Lead			510	-
Totals	29,400	83,450	10,075	13,535

(Various Sources)

\*Sn + WO<sub>3</sub>



E.L. NO.	AREA Km <sup>2</sup>	LICENCE HOLDER	RENEWAL DATE
34/86	226	PLACECO (Aust.) P.L.	28/1/89
43/87	200	BACH HOLDINGS P.L. & MINPROC P.L.	21/3/89
48/87	94	TOTTENY P.L.	21/1/89
76/87	145	P.F. MINING SHELF (No.16) P.L.	21/5/89
92/87	72	MINERAL HOLDINGS AUST. P.L.	28/10/89
4/88	14	V. THREADER	18/8/89
5/88	4	SPECTRUM RESOURCES P.L.	11/7/89
31/88	59	GOLDSEARCH LTD.	21/10/89
42/88	25	NARGUN P.L.	7/11/89
52/88		ALCASTON MINING N.L.	PENDING
RL 871	7	TRIAKO MINES N.L. & BUKA MINERALS N.L.	8/3/91
RL 872	8	TRIAKO MINES N.L. & BUKA MINERALS N.L.	8/3/91
RL 8713	4	SPECTRUM RESOURCES P.L.	23/12/90
RL 8714	4	BHP CO. LTD.	8/3/91
RL 8715	6	HELLYER MG. & EXP. P.L.	30/5/93
RL 8723	7	HELLYER MG. & EXP. P.L.	30/5/93
RL 8808	3	WHEAL LUTWYCHE P.L.	25/11/91

NB. CORRECT AS AT 2/12/88



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REVISIONS		NORTH EAST TASMANIA		Compiled : RJE
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<b>EXPLORATION TENEMENTS</b>				Checked : JGP
<b>N. E. TASMANIA AS AT 2/12/88</b>				Plate No. : FIG. 2
Location Code :		Scale : As shown	Date : December, 1988	

## 2. INTRODUCTION

This report fulfills part of a commission to outline current tin prospects in Tasmania. Part 1 dealt with the Western Tasmanian Tin Province. This volume deals with prospects in the NE Tasmanian Tin Province.

All the known unworked deposits, occurrences and geological environments with significant identifiable potential are listed. The report is not an exhaustive catalogue of all tin occurrences or prospects in NE Tasmania. Nor is there any attempt to assess the tin potential from an overtly geological or conceptual viewpoint.

The largest of the past producers not detailed in Section 5 are the St. Helens alluvial deposits (2000t Sn), and the Rex Hill Mine west of Rossarden (a greisen pipe in granite - 750t Sn, see Figure 8). The former have been well tested and shown to have little potential, while the latter appears worked out although there is no modern data on which to base an informed opinion.

Considerable research has been undertaken in compiling the report in order to get as an accurate a picture as possible, and to try and resolve the numerous inconsistencies and errors in some existing data.

Sections 3 and 4 of the report draw on data contained in the open file report by L. de Graaf of the Shell Company's Research Group, entitled 'A Preliminary Regional Assessment of the Granites and Tin Potential of N.E. Tasmania' (1983). This is an excellent synthesis of the important geological aspects of the tin mineralisation.

The author has also drawn on various data, both published and unpublished, by N.J. Turner and P.L.F. Collins of the Tasmanian Mines Dept.

### 3. GEOLOGICAL SETTING

The extent of the NE Tasmanian Tin Province is shown in Figure 1. Its western limit is defined by the NW-trending Tamar Fracture Zone which divides it from the Western Tasmanian Tin Province.

The geology of NE Tasmania is dominated by Siluro-Devonian micaceous quartzwackes and mudstones of the Mathinna Beds, intruded by large Upper Devonian granite complexes. These rocks are unconformably overlain by flat-lying Upper Carboniferous to Triassic sediments intruded by very large Triassic dolerite sheets. These rocks are in turn unconformably overlain by Tertiary and Quaternary fluvial terrestrial and marine sediments, particularly in the northern part of the area.

The principal granite complexes are the Blue Tier and Scottsdale Batholiths. These are separated by a NW-trending belt of folded Mathinna Beds sediments. Both batholiths contain three main granitic phases - granodiorites, adamellites and alkali-granites. These are of multi-intrusive character and have been divided into a series of plutons and sheets. The alkali-granites, with which the tin mineralisation is associated, are the youngest of the granitic intrusives and have been dated at 364-374 my.

There are three principal intrusions of stanniferous alkali-granites:

- the Lottah Sheets at Blue Tier
- the Mt. Paris Mass
- the Ben Lomond Granite in the Rossarden-Royal George area.

The location of all alkali-granites is shown in Figure 1. These tin-granites are confined to the upper levels in the batholiths and occupy about 10% of their surface (Young 1979). Groves (1971) considered they represent the low-volume residual liquids of the primary granitic magmas.

The regional structural grain of both the Mathinna Beds and granites is NNW or NW and probably reflects deep-seated Paleozoic structural lineaments essentially parallel to the Tamar Fracture. This structural grain has influenced some control over the distribution of the tin mineralisation, both regionally and locally.

#### 4. TIN MINERALISATION

Tin mineralisation is associated with the alkali-granites and has been attributed to the development, through extensive fractionation, of a hydrothermal fluid in which Sn, F and other incompatible elements were concentrated. Greisenisation occurred when this late melt, located near the roof zone of the granite body, lost equilibrium with earlier formed (higher temperature) minerals (Taylor 1980 - see Bibliography 5.1).

These hydrothermal fluids tended to 'pond' in 'traps' at or close to the flat-lying upper contact of the alkali-granite intrusion, particularly in cupolas or other structural highs and irregularities. Here they formed flat-lying sheets or steeply-dipping veins and lodges of endogranitic mineralised greisen. Some greisens formed at the contact of alkali-granite and Mathinna Beds sediments (as in the Mt. Paris Mass), others at the contact of alkali-granite and barren earlier granitic phases (as in the Blue Tier Tinfield). See Figure 3.

Clearly, the shape of the alkali-granite roof zone was a major control on the tin mineralisation. Definition of the original granite topography is an important part of exploration for greisen-style mineralisation.

In NE Tasmania the greisens are markedly limited in depth, and generally the bulk of alteration and mineralisation lies within 50 metres of the upper alkali-granite contact. The steeply-dipping structure-hosted greisen body at the Royal George Mine is a notable exception, with the greisen extending to a depth of over 200m. Generally greisenisation extends to greater depth than the tin mineralisation.

This depth-dependence of the tin mineralisation also has important exploration connotations. Once the alkali-granites are unroofed the higher grade tin mineralisation risks being quickly eroded. The most prospective zones are obviously those close to, or still shallowly covered by, the overlying Mathinna Beds or barren earlier granites.

The greisens are characterised by granular-textured quartz-muscovite-tourmaline-topaz-fluorite-sulphides-cassiterite. The principal alteration types being silicification and sericitisation. In the strongest greisen zones some secondary carbonate is often present - generally siderite or ankerite.

The greisens have elevated  $\text{SiO}_2$  and Fe contents. Elevated trace elements include F, Li, Rb, Nb, Sn, W, Cu, As, Zn and Ag. Of these, Sn, W, Cu, Zn and Ag are likely to be of economic significance. Greisens are depleted in Ba, Sr, Zr and Y. U levels average around 23 ppm which is anomalous but not unusual for tin granites.

From an exploration viewpoint, areas with tin potential within the alkali-granites can be recognised by low Ba/Rb ( $<0.2$ ) and high Rb/Sr ( $>20$ ) ratios, distinctly elevated F and Li contents, and anomalous total gamma radiation. At the Anchor Mine, Renison (Cartwright 1983 - see Bibliography 5.1), showed that Ga and Rb are significantly enriched and Ca depleted, in the barren adamellite within 100m of mineralisation in

the underlying alkali-granite. Occurrences of accessory topaz and/or tourmaline are also important indicators of differentiated/mineralised granites.

The styles of tin mineralisation can be summarised as follows :

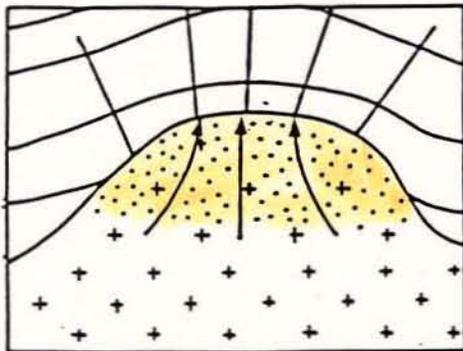
1. Endogranitic flat-lying or steeply-dipping tabular sheets of greisen with disseminated cassiterite and sulphides, occurring in the roof zones of alkali-granites.
2. Quartz or quartz-greisen veins, generally thin and steeply-dipping, hosted by alkali-granite and containing coarse-grained cassiterite, sulphides + wolframite.
3. Quartz-cassiterite-sulphide + wolframite vein swarms in Mathinna Beds sediments overlying alkali-granite.
4. Alluvial and elluvial cassiterite deposits in Tertiary and Quaternary sediments.

The various styles of tin mineralisation are well illustrated in the figures in Section 5. See also Figure 3.

The greisenised zones in the alkali-granites are often surrounded by haloes of argillic alteration containing tin values in the range of 100-1000 ppm Sn. This soft argillised granite was extensively sluiced by the old miners. It also readily decomposed to form 'elluvial' deposits. Much of the so-called 'hard-rock' mining on the Blue Tier and Mt. Paris tinfields was of this type.

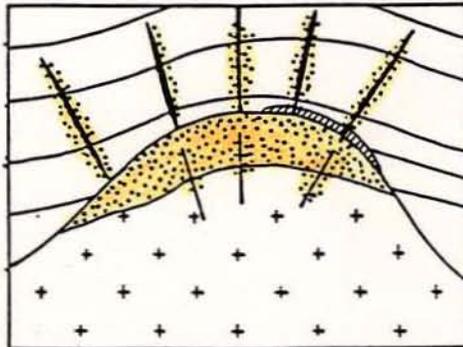
No sulphide-hosted tin mineralisation of the type found in the Western Tasmanian Tin Province occurs in NE Tasmania. The Mathinna Beds are devoid of carbonate lithologies and no skarn development is known. Minor disseminated magnetite, sufficient to cause a detectable magnetic anomaly, is present in the Mathinna Beds hosting the Great Pyramid deposit and is considered due to metasomatic alteration around the postulated underlying granite.

TWO TYPES OF ALKALI GRANITE SETTINGS



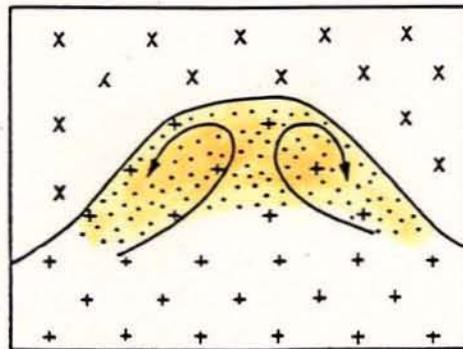
(a) Contact of roof zone alkali-granite with sediments.

Volatile build up in cupola causes hydraulic fracturing of sediments.



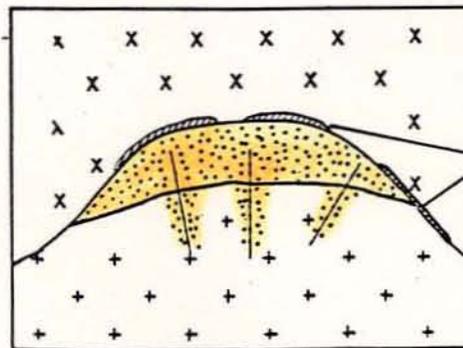
Sn mineralisation forms in veins in overlying sediments; and in greisen sheets and veins/lodes, in the host granite.

Pegmatite lenses



(b) Contact of roof zone alkali-granite with older barren granite.

Roof zones of granite rocks frequently form a very tight seal. Volatile build-up will extensively alter the fractionated top of alkali-granite as it will "stew" in a mixture of water, HF, HCl, etc. for a protracted period of time, resulting in extensive greisenisation. Sn-mineralisation is mainly confined to these "sheets" of greisens.



Pegmatite lenses

Modified from de Graaf (1983)

-  SEDIMENTARY ROCKS
-  UNDIFFERENTIATED GRANITES
-  ALKALI GRANITES
-  VOLATILES AND GREISENS

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**TWO TYPES OF ALKALI GRANITE SETTINGS**

Compiled : JGP  
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 Plate No. : FIG 3

Location Code :

Scale : NTS

Date : December, 1988

Plate No. : FIG 3

## 5. DETAILS OF INDIVIDUAL PROSPECTS AND PROSPECTIVE AREAS

Areas and deposits considered to have significant tin potential are detailed in this section. They are not presented in order of merit. Figures relating to each prospect are located at the end of the respective sub-section.

### 5.1 ANCHOR (and Blue Tier Tinfield)

**LOCATION:** The Anchor tin deposit is located 22 km NW of St. Helens, near the east coast of Tasmania. It lies in steeply dissected forested country 4 km from the Tasman Highway linking Launceston and St. Helens.

**TENURE:** The deposit is covered by a 4 sq km Retention Licence (No. 8713) held by Spectrum Resources Pty. Ltd., whose stated intention is to commence mining the deposit early in 1989. The surrounding area, comprising most of the old Blue Tier Tinfield, is vacant ground at present.

**STYLE OF MINERALISATION:** Cassiterite is irregularly distributed as fine-medium grained erratic disseminations (no veins), within the roof zone of an alkali-granite sheet where it contacts an overlying older, barren porphyritic adamellite. The mineralisation is associated with pervasive alteration (greisenisation) of the alkali-granite caused by the 'ponding' of late-magmatic and hydrothermal fluids beneath structural irregularities in the roof zone. The intensity of mineralisation and greisenation decreases with depth and is largely confined to the upper 30-40 m of the roof zone. Not all the greisen carries tin. Very minor amounts of sulphides are present (cp, sp, molybdenite) as well as wolframite and silver.

The mineralisation is located in a flat-lying zone 750m long and 100-200m wide, trending NE from the old open cut. Using a cut-off of 0.2% Sn the mineralisation resolves itself into two lenses: A Lens lies NE of the old open cut, in the apical region of the alkali-granite roof (see Figure 5). It is accompanied by intense alteration and the host granite has been converted to a granular quartz-topaz-muscovite greisen. B Lens mineralisation lies slightly below A Lens, adjacent to a structurally complex area of the granite roof in the east face of the old open cut. B Lens is hosted by less intensely altered greisenised granite.

Overall, the key elements of the mineralisation are its low grade and erratic distribution.

**GEOLOGY:** The Anchor deposit is part of the Blue Tier Tinfield, a series of tin occurrences within granites of the Upper Devonian Blue Tier Batholith. Two granite phases are present: an older coarse grained, porphyritic biotite adamellite (the Poimena Pluton), which is intruded

and underlain by flat-lying sheets of medium grained, equigranular muscovite-biotite alkali-granite (the Lottah Sheets). At the Anchor, tin mineralisation occurs in the roof zones of the younger intrusive, known locally as the Anchor Granite.

In the deposit area a microgranitic phase associated with the Poimena Adamellite is present in places along the contact with the alkali-granite. The contact itself is marked by the sporadic development of a flat-lying thin pegmatite zone (see Figure 6). The adamellite and microgranite are strongly oxidised to depths of 20m+. The Anchor deposit is cut by the major NW-trending Crystal Creek Lineament which appears to have been a control on mineralisation and structure, both at the Anchor and elsewhere in the Blue Tier Tinfield (Roberts 1982).

**EXPLORATION AND MINING HISTORY:** The Blue Tier Tinfield has a history of intermittent alluvial and lode tin production, mainly in the period 1870-1920. The Anchor deposit was discovered in 1881 and recorded production from 1890-1942 is 2360 tonnes of tin from open-cut operations, mostly by the Anchor Tin Mining Company which produced 2590 tonnes of tin concentrates from 1.32 million tonnes of ore (a recovered grade of 0.14% Sn). The old open cut covers 5 ha, measures 380m NE-SE and averages 120m in width. The Anchor accounted for an estimated 80% of total lode tin production from the Blue Tier Tinfield.

Since mining stopped in 1942, significant exploration at the Anchor has been carried out by Aberfoyle Tin Development Partnership (1963-66), and Renison-Goldfields (1977-84). Aberfoyle drilled 39 diamond drill holes and delineated four flat-lying zones of mineralisation. They calculated the resource at 1.99 million tonnes @ 0.32% Sn.

Renison's work was continuous and comprehensive. They set out to define a large-tonnage low-grade open-cuttable deposit at the Anchor. Between October 1977 and June 1981 Renison conducted five diamond drilling programmes totalling 81 holes. They also carried out metallurgical testing, geochemical and petrological studies, resource calculations and feasibility studies.

Initially, the Renison programme was successful. In January 1980 an Indicative Feasibility Study showed that reserves of 2.5 million tonnes @ 0.4% Sn would support a viable mining operation. This figure was achieved by further drilling during 1980 when 'possible ore reserves' were calculated at 2.5 million tonnes @ 0.4% Sn using a 0.2% Sn cut-off.

However, a programme of in-fill drilling and bulk sampling for metallurgical testing, conducted between November 1980 and June 1981, demonstrated a lack of continuity of the mineralisation in key areas and significant differences between (higher) grade estimates based on drilling, and those (lower) based on metallurgical bulk samples from the same locations. The metallurgical testing itself indicated tin recoveries of +80% were feasible.

The severely-downgraded resource calculation at the completion of the in-fill drilling (634,000 tonnes @ 0.49% Sn, at 0.2% Sn cut-off), did not approach the objective of the Definitive Feasibility Study so Renison suspended work on the Anchor and switched the emphasis to testing other prospects on the Blue Tier Tinfield. Here, their best result from 43 holes on at least 8 prospect areas was definition of an estimated 110,000 tonnes @ 0.4% Sn at the Moon prospect, 3 km north of the Anchor. Renison ceased exploration in 1984.

**RESOURCE:** Renison's final resource calculations (Ross 1981), were as follows :

1. POSSIBLE ORE - at 0.2% Sn cut-off :
 

A Lens	425,500 tonnes @ 0.51% Sn	
B Lens	208,500 tonnes @ 0.45% Sn	
Total:	634,000 tonnes @ 0.49% Sn	(3100 tonnes of contained tin)
  
2. ADDITIONAL ORE POTENTIAL (mineralisation peripheral to above lenses) - at 0.1% Sn cut-off:
 

2.88 million tonnes @ 0.23% Sn (6600 tonnes of contained tin).

---
  
3. TOTAL POSSIBLE & POTENTIAL ORE: 3.51 million tonnes @ 0.28%Sn  
(9700 tonnes of contained tin)
 

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4. TOTAL POTENTIAL RESOURCE - at 0.05% Sn cut-off:
 

8.8 million tonnes @ 0.18% Sn (15,800 tonnes of contained tin).

Although not specified, the resource also contains approximately 8 g/t Ag, 100 ppm Cu, 200 ppm Zn and 17 ppm U.

Assuming production prior to 1943 of 2500 tonnes of tin and recoveries of about 70%, the total ore mined from the Anchor to date can be estimated at around 1.6 million tonnes grading 0.23% Sn. Combining this with Renison's Possible and Potential Ore figure at 0.1% Sn cut-off, gives an ORIGINAL RESOURCE ESTIMATE of 5 MILLION TONNES @ 0.26% SN (13,500 tonnes of contained tin).

**POTENTIAL:** The apparent lack of continuity of the mineralisation as outlined by Renison's infill drilling, and the marked decrease in grade in the PQ metallurgical holes as against the NQ-BQ exploration holes, raises concerns as to the reliability of Renison's quoted resource figures.

There is a clear inference that the quoted grade figures may be overstated and that closer-spaced and larger-diameter drilling could see a reduction in the overall resource grade.

Certainly, the early drilling seems to have been too small diameter (BQ) and the holes too widely spaced, to be really reliable. The drilling was not systematic with the spacing between holes after the infill drilling varying between 15 and 60m with most around 30-40m. In some areas there is an obvious need for the pattern to be closed up.

Because of the open drill pattern, there is undoubtedly some limited potential for additional tonnage of economic mineralisation in the immediate Anchor area - as acknowledged by Ross (1981).

While the indicated resource at the Anchor may be sufficient for a viable small open-cut operation at the current tin price (A\$11,000/tonne), the erratic distribution and overall low grade of the mineralisation means careful grade control and selective mining will be required.

#### NOTES ON THE BLUE TIER TINFIELD

When the Anchor is excluded, the Blue Tier Tinfield was a very small producer with total recorded production from hard-rock sources of around 600 tonnes of tin (Ross 1978). However, the numerous tin prospects in many cases represent the eroded remnants of originally more-extensive mineralisation (see below), and the detrital cassiterite so-formed has contributed at least 13,000 tonnes of tin to the extensive alluvial deposits in the Ringarooma River system to the north of the Blue Tier (see Section 5.6).

The mineralisation within the tinfield (in every case, cassiterite with minor sulphides and wolframite), falls into three main styles :

1. Floor (or Roof) deposits: flat-lying greisens of Anchor Type. (e.g. Moon, Michael).
2. Vein deposits: quartz or quartz-greisens veins, which occur mainly in the stanniferous alkali-granite but can also occur as 'leakage' in the older adamellite where it overlies mineralised alkali-granite (e.g. Lottah Tunnels, FB Lode).
3. Dyke deposits: erratic, steeply-dipping mineralised bodies in alkali-granite dykes. (e.g. Southern Cross).

Only the floor deposits are attractive exploration targets and offer the possibility for the development of large-tonnage low-grade deposits.

From 1978-84, Renison carried out mapping, geochemical surveys and drilling on the Blue Tier Tinfield. They also made use of litho-geochemistry to define prospective areas following orientation surveys at the Anchor which showed that Ga and Rb are significantly enriched, and Ca depleted, in the Poimena Adamellite within 100m of mineralised alkali-granite (Cartwright 1983). They also made use of the pattern of enrichment of Rb, Sn and Cu within the upper and marginal areas of the alkali-granite (Cartwright 1982).

Renison were able to construct structural contours which showed that the stanniferous alkali-granite intrusive underlying the tinfield has the form of an irregularly-shaped, steep-sided ovoid body with a flattish but highly irregular upper surface. Mineralised greisens formed beneath cupolas, domes and ridges, on the upper surfaces and steep flanks of the intrusion. The Anchor deposit and Moon prospect are examples of flank-situated greisens.

However, the Renison work also showed that at the present exposure level most of the upper-surface traps and their greisens have been eroded away, leaving only remnants. Cartwright (1982) concluded that the possibility of uneroded or buried greisens at the top of the intrusion would appear to have been exhausted by Renison's work, and that shallowly-buried flank-traps in the more geochemically anomalous East and North-east areas of the alkali-granite were the most promising remaining targets.

It was beyond the scope of Renison's exploration programme to exhaustively test the potential for buried greisens on the Blue Tier. Although their work has restricted the prospective area, possibilities for flank-trap deposits of Anchor style remain.

In 1979-80, Aberfoyle (Young 1979 and Taylor 1980), demonstrated that the scattered greisen occurrences in the Cream Creek area (in the NW corner of the Blue Tier Tinfield), were probably part of a single large sheet of mineralised greisen largely hidden beneath a shallow cover of barren older adamellite. Young estimated the average grade of the greisen at 0.2-0.3% Sn (based largely on early Mt. Lyell Co. sampling) and Taylor suggested there was potential for a deposit of at least 2 million tonnes (see Figure 7).

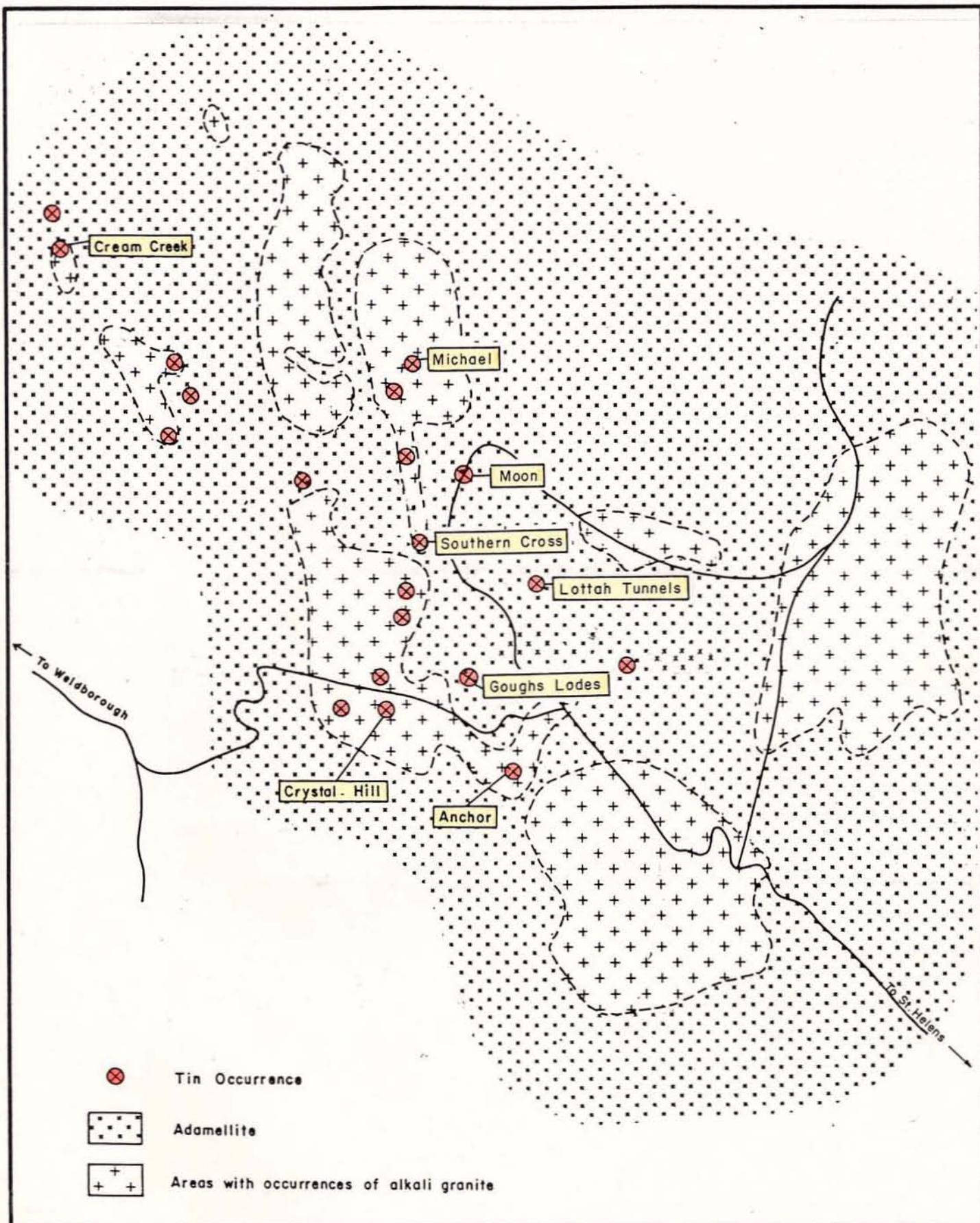
Although Renison did very little work in this area (which was on the edge of their EL), their structural analysis shows that any deposit at Cream Creek would be in a flank-trap situation similar to the Anchor. The Cream Creek Mine produced 180t Sn prior to 1930 which would probably make it the largest producer on the Blue Tier after the Anchor. It has not been drilled since Mt. Lyell Co. put down 3 holes in 1908.

There is some evidence for a small cupola in the Goughs Lode area 1.5 km north of the Anchor, which appears insufficiently tested by the two holes put down there in 1984. There is also some potential to slightly increase the 110,000 tonnes @ 0.4% Sn now outlined at the Moon prospect.

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**Aberfoyle Resources Limited**  
 EXPLORATION DIVISION

NORTH EAST TASMANIA

**BLUE TIER**  
**TIN OCCURRENCES**

Compiled : J.G. Purvis

Drawn : after deGraaf 1981

Traced :

Checked :

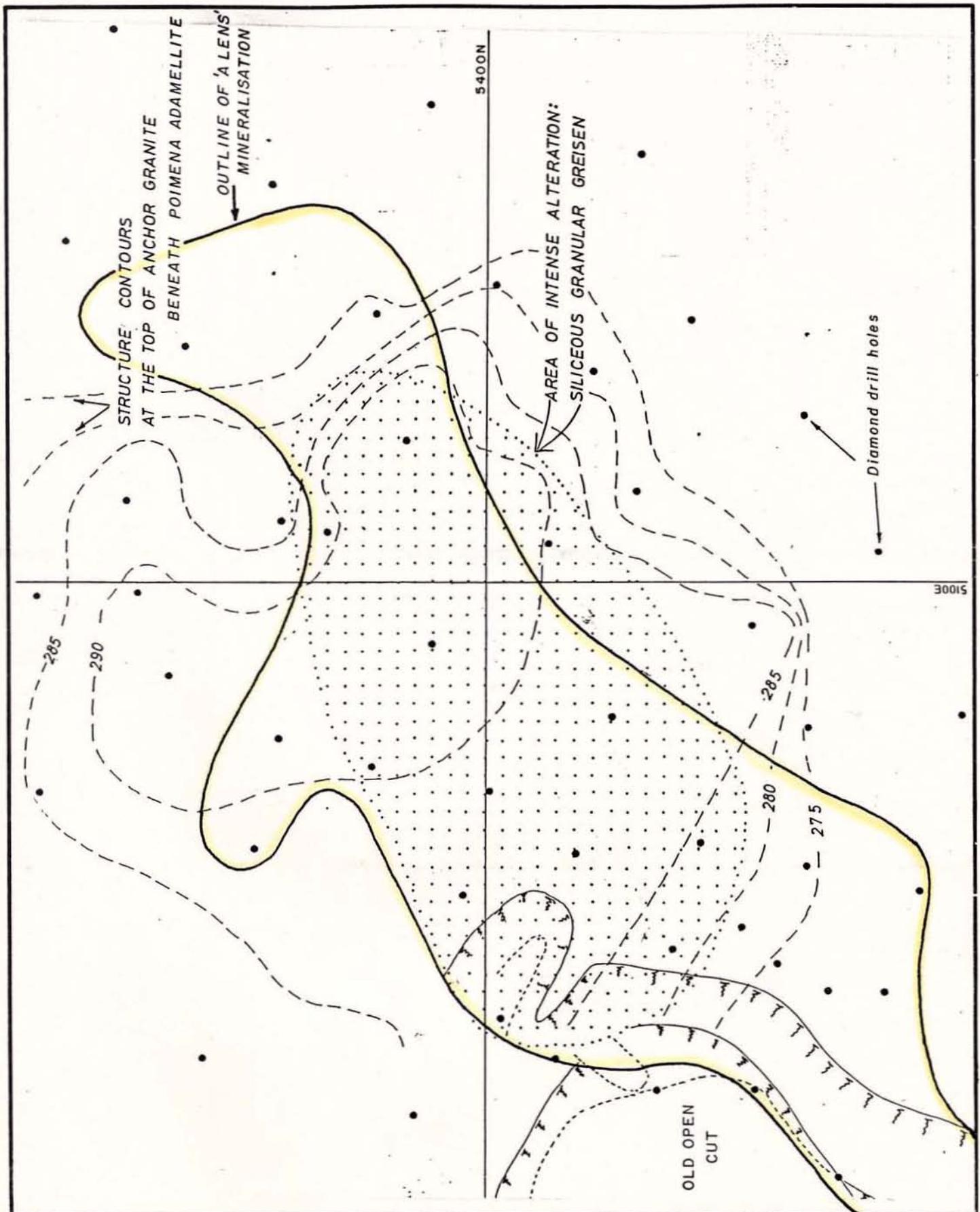
Plate No. : FIG 4

REVISIONS			
Init.	Date	Init.	Date

Location Code :

Scale : 1:75 000

Date : November, 1988



**Aberfoyle Resources Limited**  
EXPLORATION DIVISION

NORTH EAST TASMANIA

**ANCHOR MINE**  
**MINERALISATION, ALTERATION & ROOF**  
**STRUCTURE**

Compiled : J.G. Purvis

Drawn : after Ross , 1981

Traced :

Checked :

Plate No. : FIG 5

REVISIONS			
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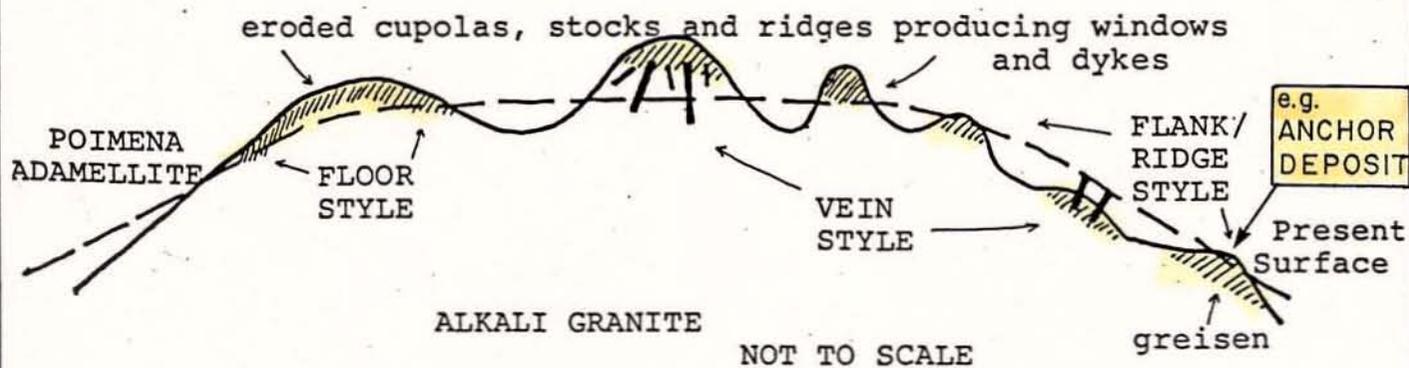
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Date : November, 1988

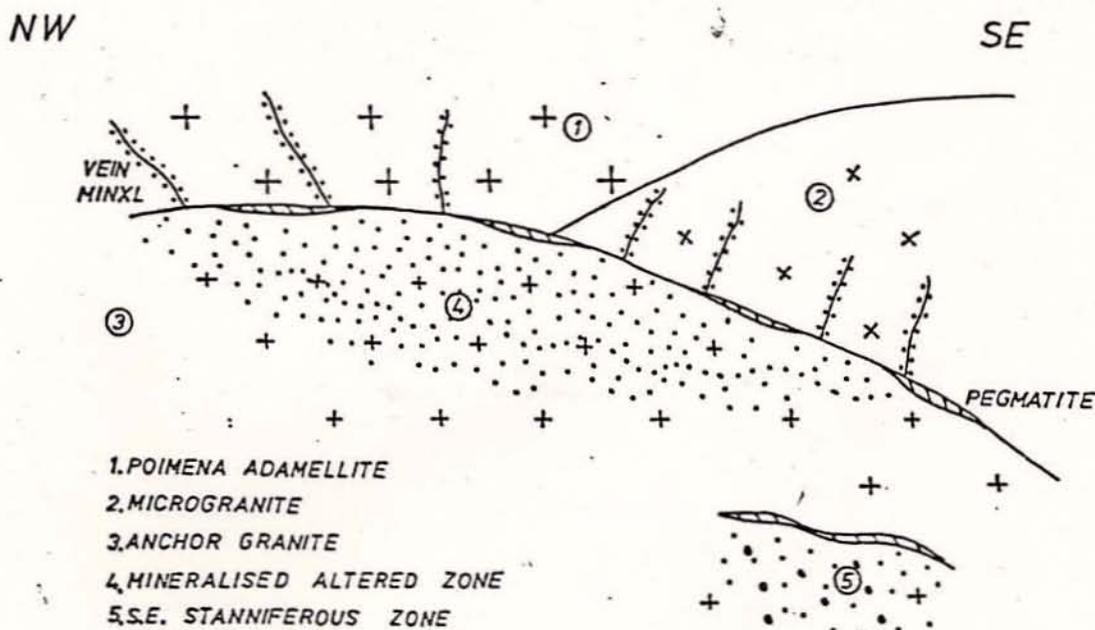
1-15-1

**SCHEMATIC SECTION THROUGH THE ALKALI GRANITE  
SHOWING STYLES AND POSITIONS OF TIN MINERALISATION**



after Cartwright, 1982

NOT TO SCALE



- 1. POIMENA ADAMELLITE
- 2. MICROGRANITE
- 3. ANCHOR GRANITE
- 4. MINERALISED ALTERED ZONE
- 5. S.E. STANNIFEROUS ZONE

after Ross, 1981

**CONCEPTUAL DIAGRAMMATIC SECTION  
THROUGH ANCHOR MINE AREA**

**Aberfoyle Resources Limited  
EXPLORATION DIVISION**

**NORTH EAST TASMANIA  
BLUE TIER AREA  
GEOLOGICAL CROSS SECTIONS**

Compiled : J.G. Purvis

Drawn :

Traced :

Checked :

Plate No. : FIG 6

REVISIONS			
Init.	Date	Init.	Date

Location Code :

Scale : not to scale

Date : November, 1988

1-15-1

Drawn: J.R.T.

Traced: R.J.E.

Checked:

Revised by: Date:

NORTH EAST TASMANIA

CREAM CREEK AREA

BLUE TIER

Location code:

Date: July, 1980

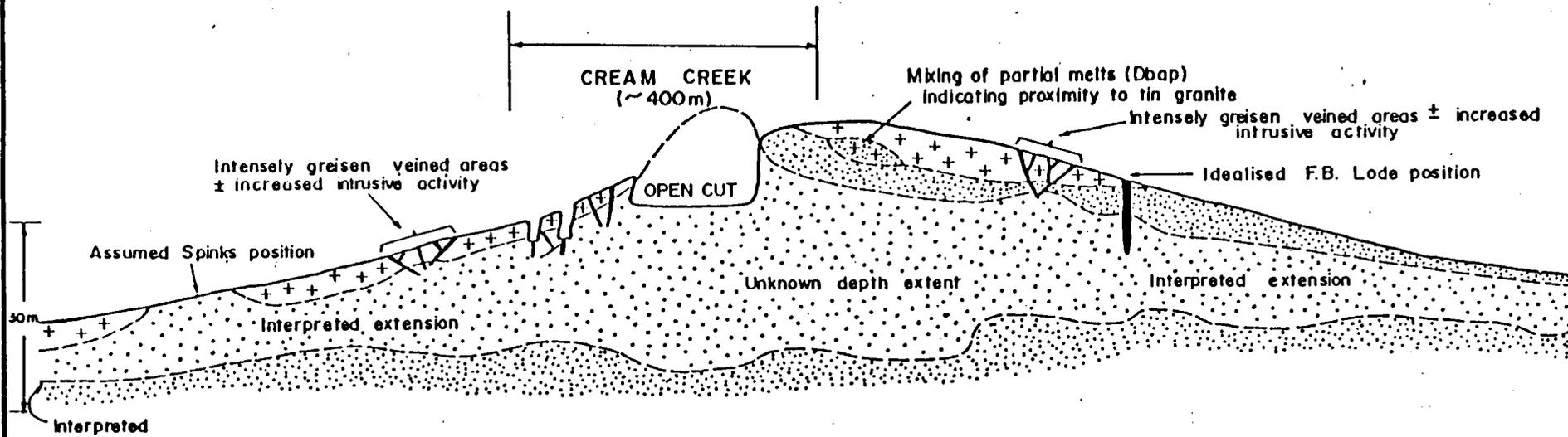
Scale: N.T.S.

Plate No FIG. 7

**Alteration and Mineralization**

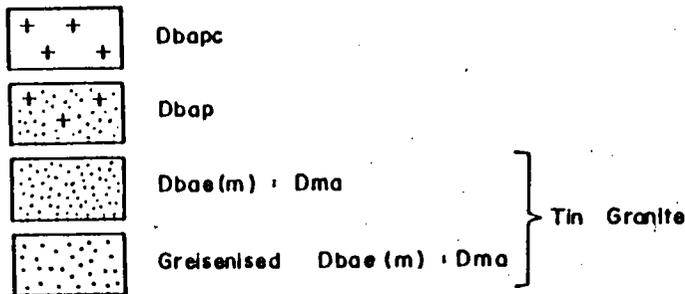
Note: Diagrammatic representation - distorted horizontal scale

- Position of greisen sheet with respect to other granitic phases
- Altitude of Contacts



Diagrammatic representation of the processes involved with the alteration and mineralization. The following factors are considered to represent excellent indicators of unnaturally high late stage crystallization and hence prospective areas for unexposed tin mineralization.

- strongly greisen veined zones
- abundant aplitic and pegmatic intrusions
- abundant late stage phases e.g. muscovite  
tourmaline (microplitic matrix)  
topaz etc.



(from Taylor, 1980)

## 5.2 ROYAL GEORGE

**LOCATION:** The Royal George tin deposit is located 15 km ESE of Avoca in eastern Tasmania. Access is excellent, with the deposit lying on a low sparsely-forested hill about 1 km from the Avoca-Swansea road.

**TENURE:** The deposit is covered by recently-granted EL 5/88 of 4 sq. km belonging to Spectrum Resources Ltd., a small New Zealand-based explorer. About 30% of the known deposit, and its possible NW extensions, lie on private land where there is disagreement between the Department of Mines and the landowner regarding mineral rights. However, the landowner has always supported exploration of the property.

**GEOLOGY:** Fine-grained cassiterite and sulphides (pyrite-sphalerite-chalcopyrite-arsenopyrite), occur disseminated within a steeply-dipping tabular greisen zone in alkali-granite of Upper Devonian age (part of the Ben Lomond Granite). The local setting indicates the greisen lies near the top of the intrusion, close to the original overlying Mathinna Beds contact (now eroded off). The greisen cuts across two local phases of the granite and is located within a major NW-trending regional lineament (see Figure 8).

The greisen is characterised by quartz-sericite-muscovite with lesser sulphides-fluorite-tourmaline-chlorite. Traces of torbernite (a copper-uranium phosphate) occur peripheral to the tin mineralisation.

The greisen zone strikes NW-SE and dips 75° to the SW (see Figure 9). It is open at either end and at depth beyond the presently-defined deposit, although there is an apparent diminution of tin grades. It can be traced on the ground for at least 1.5 km, mainly to the SE.

In the deposit area the mineralised greisen is up to 30m wide with diffuse margins. The zone of strongest alteration and mineralisation that comprises the deposit is up to 15m wide (average 10m), over 350m long and extends to over 150m in depth. It is made up of parallel diffuse bands (clearly originally fracture or joint-controlled), of stronger alteration and disseminated cassiterite, within lower grade zones (see Figure 10). There is no veining of any sort. A prominent jointing parallel to the strike and dip of the zone is visible in the open cut.

There are several other small tin-greisen occurrences in the Royal George area.

**MINING AND EXPLORATION HISTORY:** The mine was worked by an open-cut and on two levels via an inclined shaft, from 1911-22 producing 170,000 tonnes of ore grading 0.65% Sn. Little or no further work seems to have been carried out until 1955 when the first discovery of uranium in Tasmania was made in the old open-cut. This prompted the first drilling of the deposit (1955-57) when 4 holes were put down, 3 by BHP. The holes intersected the tin deposit below the old workings but uranium values were low, so work was discontinued.

From 1965-71 the Cornwall Coal Co. conducted a systematic exploration programme aimed at proving up the deposit. They drilled 13 new diamond drill holes, deepened the inclined shaft and drove No. 3 and 4 levels. They took underground channel and bulk samples, did preliminary metallurgical testing and established the grade of the old tailings.

From 1979-82 CRA, in a JV with Cornwall Coal thoroughly evaluated the property, resampled the old drill core and redefined the resource. They drilled one hole to test the depth extent of the deposit which showed that although the greisen zone extended below 200m from surface the tin values declined markedly. CRA conducted metallurgical tests on the ore, did surface exploration along the trend of the Royal George greisen-bearing structure and examined the smaller prospects in the area.

After CRA's withdrawal Cornwall Coal Joint Ventured the deposit and surrounding area to Amax (1983), and Shell (1984-85). Neither of these parties did any work at Royal George itself. Cornwall Coal finally relinquished the area in 1986. Spectrum's recent pegging signals renewed interest in the deposit.

**RESOURCE:** In 1967, the Tasmanian Mines Department (Noldart 1967), calculated 'indicated and probable reserves' on the basis of the Cornwall Coal and earlier drilling, at 161,600 tonnes @ 0.61% Sn.

On the basis of the resampling of the 18 drill holes and underground channel sampling, CRA (Purvis 1979) calculated 'reserves' using a 0.25% Sn cut-off, as 590,000 tonnes @ 0.41% Sn, 12 g/t Ag and 0.21% Zn (2400 tonnes of contained tin). The resource lies in a 350m long zone between 30m and 170m below surface.

Because of the small core size (Ax and Ex) and core losses in the more friable mineralised zones, Purvis considered the resource could be understated by as much as 25% in both tonnage and grade, giving a potential resource of 750,000 tonnes @ 0.5% Sn (3750 tonnes of contained tin).

Combining mined ore with the calculated resource, gives an ORIGINAL RESOURCE ESTIMATE of 760,000 TONNES @ 0.46% SN (3500 tonnes of contained tin).

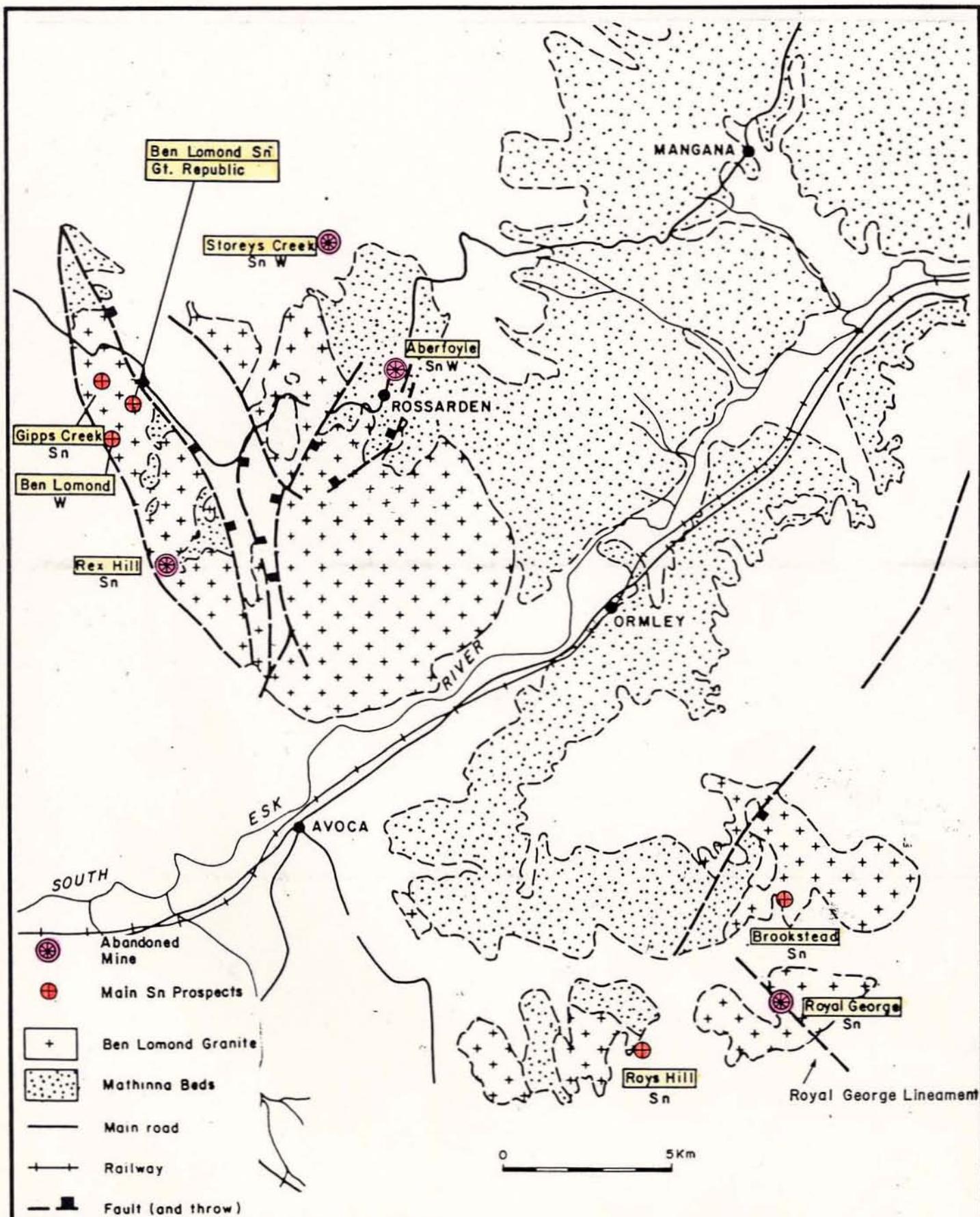
**POTENTIAL:** Royal George is one of the strongest of the NE Tasmanian tin greisen systems and probably ranks second only to the Anchor Mine. The mineralised greisen is remarkable for its regularity, strength and depth extent. The Royal George greisen marks a major regional lineament which undoubtedly has further potential for tin mineralisation.

The deposit itself and its immediate environs have never been properly tested and there is some scope for the discovery of additional ore. As pointed out by Purvis (1979 & 1981), the small diameter of the existing drill holes and the substantial core losses within the mineralised intersections, mean the present resource grades are wholly unreliable and probably considerably understated. Because of the banded high-grade/ low-grade/high-grade nature of the mineralised zone, any increase in grade of individual bands would also lead to an increase in tonnes as peripheral bands became economic and the mineable width increased.

While the indicated deposit size (<1 million tonnes), and grade (0.4-0.5% Sn), is modest, the good rock conditions and simple metallurgy of the ore are factors which suggest a profitable small-scale mining operation may be feasible at Royal George at current tin prices (\$11,000/tonne).

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# Aberfoyle Resources Limited

EXPLORATION DIVISION

NORTH EAST TASMANIA

## BEN LOMOND GRANITE

### ROYAL GEORGE & OTHER OLD MINES & PROSPECTS

Compiled : J.G. Purvis

Drawn : after de Graaf 1983

Traced :

Checked :

Plate No. : FIG 8

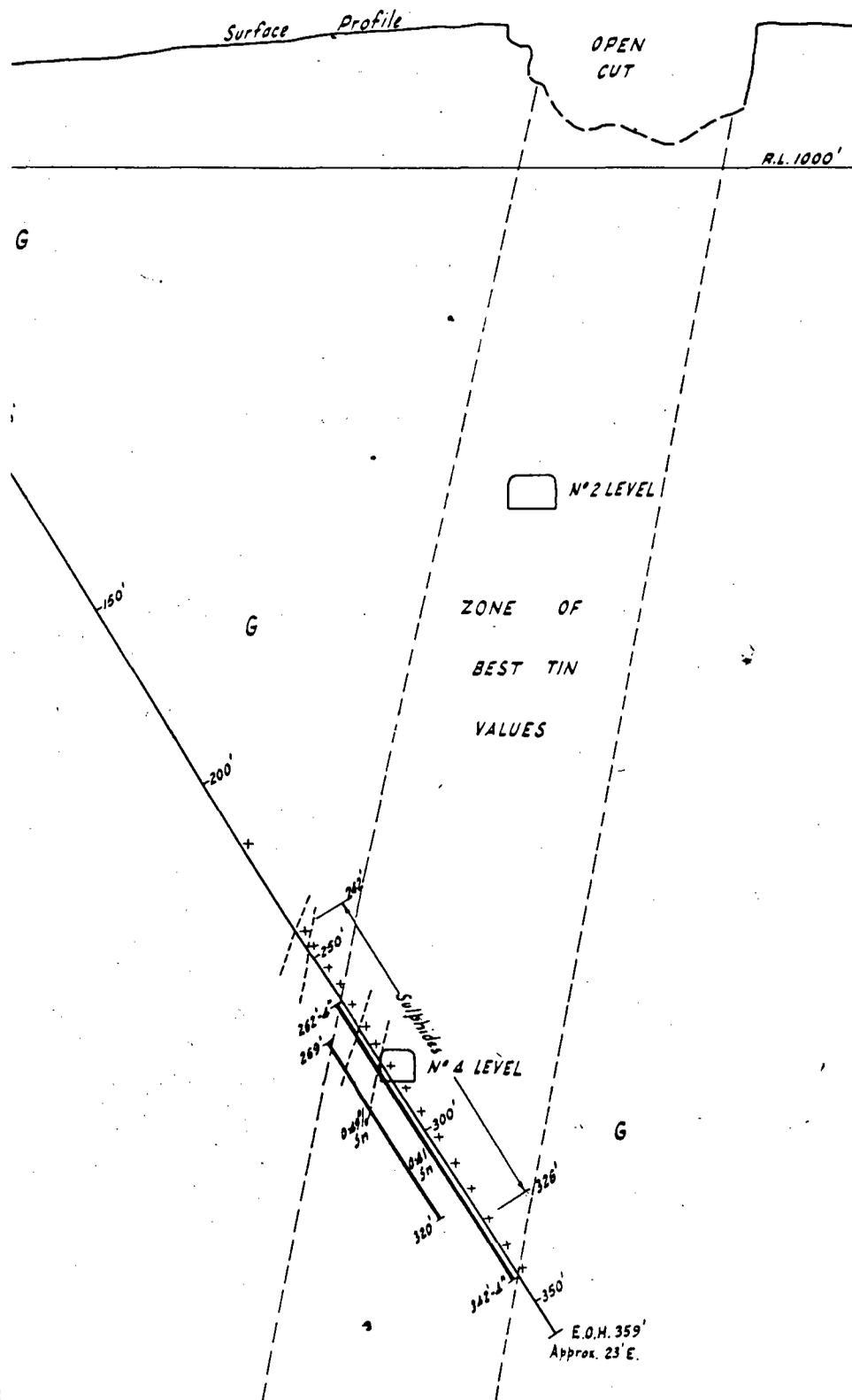
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Location Code :

Scale : As shown

Date : November, 1988

N.E



LEGEND

-  Mineralised fractures or 'greisen' bands
- G** Altered biotite granite with tourmaline
- +** 'Greisenised' zone or occasional 'greisen' bands within the granite

**Aberfoyle Resources Limited**

EXPLORATION DIVISION

NORTH EAST TASMANIA

**ROYAL GEORGE MINE**

**CROSS SECTION**

Compiled : JGP

Drawn : after Purvis, 1981

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Checked :

Plate No. : FIG 9

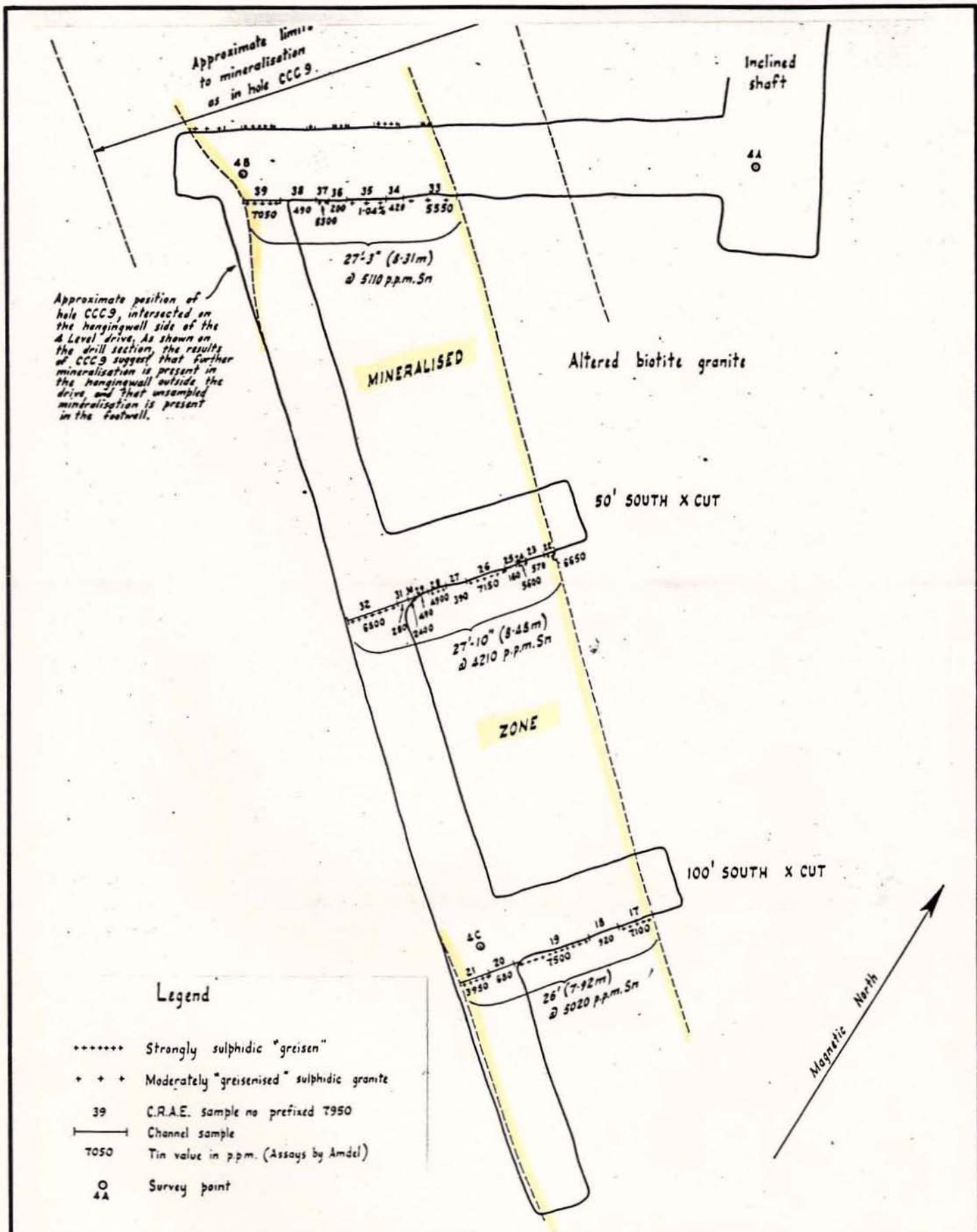
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Location Code :

Scale : 1" = 50'

Date : December, 1988

15-1



## Aberfoyle Resources Limited

EXPLORATION DIVISION

REVISIONS				NORTH EAST TASMANIA		Compiled : JGP	
Init.	Date	Init.	Date	<b>ROYAL GEORGE MINE</b>		Drawn : after Purvis, 1981	
				4 LEVEL SHOWING BANDED NATURE OF		Traced :	
				THE ORE ZONE		Checked :	
Location Code :				Scale : 1 : 200		Date : December, 1988	
						Plate No. : FIG 10	

1-10-1

### 5.3 GREAT PYRAMID

**LOCATION:** The Great Pyramid tin deposit outcrops in hilly forested country 7 km NW of Scamander, on the east coast of Tasmania. Forestry tracks provide good access.

**TENURE:** The property is held by BHP under Retention Licence RL 8714 of 4 sq km, valid until March 1991.

**STYLE OF MINERALISATION:** In the deposit, tin occurs as cassiterite in close-spaced parallel joints or fractures only 1-5 mm wide, within competent quartzites of the Siluro-Devonian Mathinna Beds. There is a close correlation between fracture density (at >90/m) and the better-grade mineralisation, which averages around 0.2-0.25% Sn. The fractures dip steeply and are oriented normal to a local NW - trending fold axis. They are lined with quartz, cassiterite, siderite or sulphides (principally arsenopyrite-pyrite-chalcopyrite). The cassiterite is generally >100 microns in size. The deposit is oxidised to depths of 70m and the tenor of the mineralisation decreases below this depth.

**GEOLOGY:** The host Mathinna Beds silicified quartzose sandstones ("quartzites") and shales are folded but essentially unmetamorphosed. The fractures and mineralisation are almost entirely restricted to the steeply-dipping quartzites. A major NW - trending fault with steep northerly dip transects the prospect. The deposit lies 4 km SE of adamellites and granodiorites of the Upper Devonian Mt. Pierson Pluton which marks the southernmost extension of the Blue Tier Batholith.

The mineralisation is apparently genetically linked to the intrusion of Mt. Pierson Pluton. There are numerous small mineralised occurrences for W, Mo, Sn, Bi, Pb, Zn, Cu, Ag in the Scamander district around the Great Pyramid deposit, which reflect mineral zoning around the pluton (see Figure 11). Magnetic anomalies in the Mathinna Beds in the deposit area are due to disseminated magnetite, considered related to the metasomatic aureole about a postulated high level granite intrusive beneath.

**EXPLORATION HISTORY:** The deposit was discovered in 1909. Exploratory driving and shaft sinking was undertaken up to 1914, and from 1925-36 3 tonnes of tin was produced from 336 tonnes of ore (equivalent to a head grade of 1.5% Sn) - the only production to date from the deposit.

Since 1964 the property has been the subject of several systematic exploration programmes, involving the drilling of 163 percussion and 23 diamond drill holes, by BHP (1964-65); Aberfoyle Tin Development Partnership (1969-74); Tasmanian Mines Department (1976-80); and BHP (1980-81). The property has been inactive since Shell withdrew from a JV with BHP in 1986.

Great Pyramid was evaluated by C. H. Young and K. G. Palmer of Aberfoyle in 1979 and again by Young in 1982. The author evaluated the property for CRA in 1979.

**RESOURCE:** Several calculations have been made of the tin resource at Great Pyramid by various parties using differing methods. Most of these calculations involve depth limits of 70m below surface (150m RL) and cut-offs of 0.1%Sn. The figures can be categorized as 'In-Situ Indicated Resources' and their reliability is questionable due to sampling problems (discussed in the next section - see below).

The calculations are :

Assessment By	In-Situ Indicated Resource (@ 0.1% cut-off, to 70m depth)	Contained Tin
Paringa/Aberfoyle (1969-74)	4.1 mmt @ 0.31% Sn	12,700 t
BHP (1981)	4.1 mmt @ 0.22% Sn	9,000 t
BHP (1981)	3.3 mmt @ 0.26% Sn	8,600 t
Shell (1983)	2.8 mmt @ 0.225% Sn	6,300 t
Shell (1984)	3.13 mmt @ 0.22% Sn	6,900 t
	(@ 0.2% cut-off, to 70m depth):	
Shell (1984)	0.306 mmt @ 0.46% Sn (South Block)	1,400 t

(The resource also contains 2-6 g/t Ag).

The Shell calculations by Wright & Hall (1984) are the most detailed and comprehensive. They separated the resource into 3 blocks (see Figure 12):

NORTH BLOCK	:	897,300t @ 0.19% Sn
SOUTH BLOCK	:	1,980,200t @ 0.24% Sn
BROCKS BLOCK	:	252,700t @ 0.17% Sn

---

TOTAL : 3,130,200t @ 0.22% Sn

The North and South blocks are essentially the one mineralised zone slightly offset by the major fault.

**POTENTIAL:** The feature that most affects the potential of the Great Pyramid deposit is the general absence of zones of high grade mineralisation. Using a 0.2% Sn cut-off to try and assess the potential for higher grade zones, the best Shell could do was 306,000 t @ 0.46% Sn in South Block close to a cross-cutting diorite dyke where there is increased fracturing and mineralisation (Wright & Hall 1984). Selective mining appears impossible (Young 1982), and ore sorting tests initiated

by Aberfoyle in 1979 were a failure. On the positive side, the deposit outcrops on ridges and the steep topography would assist open cut mining.

A second feature that impinges on the potential of the deposit is the the unreliability of the drilling results. Although much of the drilling was at spacings of only 20-30m, almost all assessments of the property agree the drill results are probably significantly understated.

Wright & Hall (1984) state : "From investigations made by BHP on sludge assays from diamond drilling, it is apparent that diamond drilling undervalues the grade, but this cannot be quantified". The BHP study indicated that the tin values in core were undervalued by up to 30% due to losses to sludge from poor recoveries, but Craigie (1983) in a statistical study showed that "grades from the percussion holes are 40-50% higher than for the diamond holes". There is also no correlation between tin grades in percussion holes and adjacent diamond holes.

Young (1982), considered the mineralisation had not been adequately tested because none of the drill holes and adits had tested at right angles to the mineralised fractures. In fact, some holes were oriented parallel to the fractures. Young states : "There is reasonable optimism for grade improvement should adequate testing be done normal to the fracture direction. However, it is unlikely that a major change in grade would eventuate".

All the above suggest the present calculations understate the grade of the deposit and that its true grade may be in excess of 0.3% Sn.

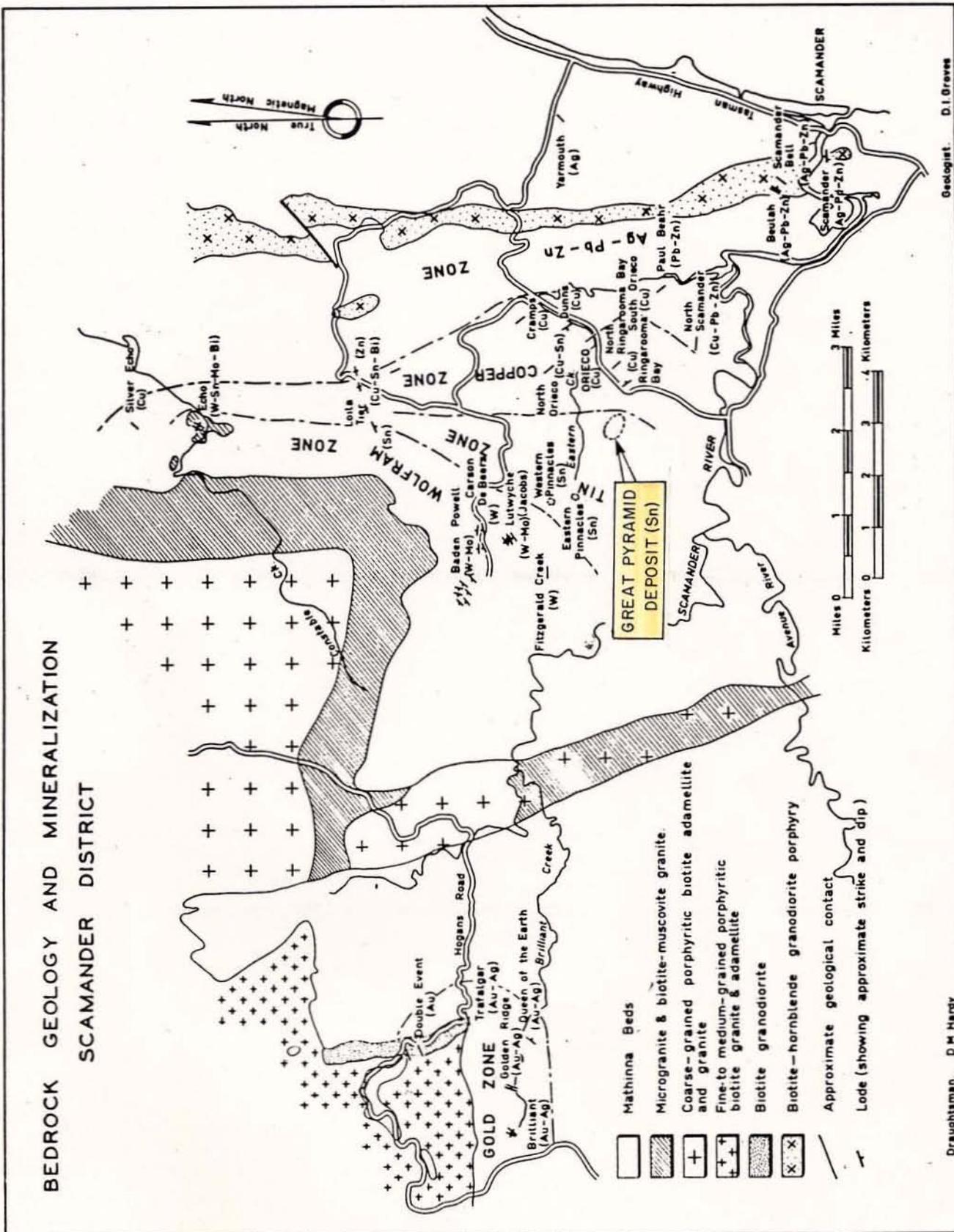
There is also potential to increase the tonnage. BHP (1981) estimated there was at least 4.2 mmt grading 0.16% Sn of 'potential ore' adjacent to the outlined resource. Young (1982) estimated 'total potential reserves' to 140 m below surface at 12 mmt @ 0.2 - 0.25% Sn (cut-off unknown). This suggests the deposit could contain up to 30,000 tonnes of tin.

There is potential for buried tin deposits in the vicinity of Great Pyramid and these could be of sheeted greisen type similar to the Anchor deposit, or further occurrences of fracture-controlled Great Pyramid-style mineralisation, as postulated by BHP. The grade of such targets will only be economic if they are close to surface, and the indications from BHP's exploration of the surrounding area are that this is not the case. There also appears to be a lack of suitable criteria by which target areas for such buried deposits might be selected. Young gave this reason for declining BHP's JV invitation on the property in 1982.

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Aberfoyle Exploration Property Examination Rep.  
plus attachments.



Geologist. D.I. Groves

Draughtsman. D.M. Hardy

## Aberfoyle Resources Limited

EXPLORATION DIVISION

NORTH EAST TASMANIA  
**SCAMANDER DISTRICT**  
 Bedrock geology and mineralisation and  
 zonal arrangement of mineral occurrences

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 Drawn : after D.I. Groves 1975  
 Traced : D.O.M.  
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 Plate No. : FIG 11

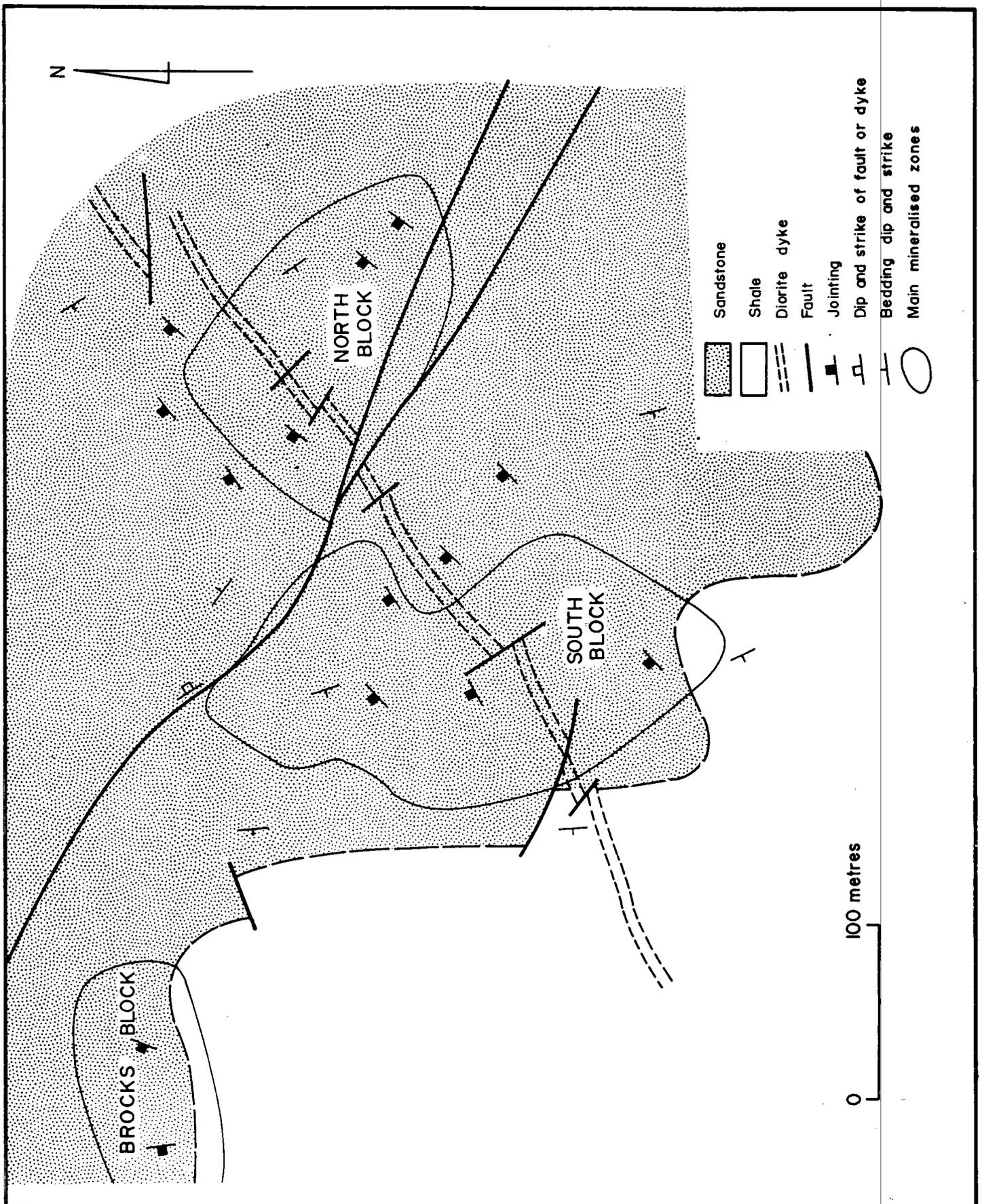
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Location Code :

Scale : As shown

Date : November, 1988

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**Aberfoyle Resources Limited**  
EXPLORATION DIVISION

NORTH EAST TASMANIA  
**GREAT PYRAMID**  
GEOLOGY

Compiled : J.G Purvis  
 Drawn : after Shell  
 Traced : RJE  
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 Plate No. : FIG. 12

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#### 5.4 ABERFOYLE - STOREYS CREEK

**LOCATION:** The old Aberfoyle and Storeys Creek mines lie 13 and 16 kms respectively north of Avoca in eastern Tasmania. The mines were serviced by the township of Rossarden - now in decline.

**TENURE:** The immediate Aberfoyle Mine area is covered by a Retention Licence of 3 sq. km. held by Wheal Lutwyche Pty. Ltd. (RL 8808). The Storeys Creek Mine and the ground around Aberfoyle is currently up for tender. The area SW of the Aberfoyle Mine is the subject of an EL application by Alcaston Mining NL (ELA 52/88).

**MINING HISTORY:** The Storeys Creek Mine operated intermittently for 100 years - from 1881 to 1981. The Aberfoyle Mine was worked from 1931 to 1982. Together, the mines produced approximately 17,800 tonnes of tin metal and 13,000 tonnes of  $WO_3$ . Ninety percent of the tin production was from the Aberfoyle Mine.

The mines were operated by Aberfoyle Tin Limited, who sold them in May 1981 to Rossarden Mines Ltd. (a member of the Bond Group of Companies), with the economic mine reserves exhausted at Storeys Creek and rapidly approaching exhaustion at the Aberfoyle Mine. Operations ceased in April 1982 when the Aberfoyle Mine finally ran out of viable reserves. Rossarden Mines carried out a very limited programme of ineffective exploration before quitting the area in late 1982.

**GEOLOGY:** The mineralised vein systems are hosted by quartzose sandstones (quartzites), siltstones and shales of the Siluro-Devonian Mathinna Beds. The sediments have been subjected to weak regional metamorphism, strike NW and are tightly folded.

The Mathinna Beds are intruded by the Upper Devonian Ben Lomond Granite - a porphyritic alkali-granite. The granite roof is gently E-dipping and is pierced by several late-stage aplitic apophyses which project up to 100m above the granite as a series of flat-topped, steep-sided domes or cupolas elongated N to NW (see Figures 15 & 16). These aplitic apophyses are genetically responsible for the mineralised vein systems in the sediments directly above.

The granite was unroofed in the mid Carboniferous to early Permian and flat-lying Permian shallow fresh-water conglomerate, siltstone and shale was deposited on both granite and Mathinna Beds. In the Aberfoyle Mine area these sediments cover the southern part of the mineralised vein system and are up to 18m thick.

**MINERALISATION:** Three major cassiterite-wolframite-sulphide quartz vein systems were worked: the Aberfoyle and Lutwyche veins (the latter with only 15,000t mined) at Rossarden, and the Storeys Creek vein at

Storeys Creek. Another mineralised vein system - the Kookaburra-occurs between the Aberfoyle and Lutwyche systems, but was not mined (see Figure 14).

The mineralised veins formed from late-stage hydrothermal fluids derived from the Ben Lomond Granite. The fluids filled hydraulic fractures and faults in the Mathinna Beds, formed at sites of concentrated stress above the western edges of the aplitic cupolas projecting above the granite roof. The mined veins are large systems of anastomosing, sub parallel and planar quartz veins. Each system comprises 2 or 3 major veins (up to 3m wide at Storeys Creek and 1.5m at Aberfoyle), in a swarm of smaller veins (over 60m wide in the Aberfoyle system). The veins strike N or NW, parallel to the direction of elongation of the aplitic cupolas directly beneath. They dip  $30^{\circ}$  -  $60^{\circ}$  W, tangential to the cupolas, which they intersect (see Figure 15). The veins cut all the tectonic trends of the region (Hellsten 1979).

The veins contain coarse-grained cassiterite, wolframite and sulphides (sphalerite, chalcopyrite, arsenopyrite and pyrite with minor tetrahedrite, stannite, molybdenite and galena). The mineralisation is zoned, with cassiterite and sulphides tending to concentrate in the upper levels of the veins and wolfram in the lower levels.

Typical grades of the vein systems and the zoning, are demonstrated by the following figures from Hellsten (1979):

<u>Vein System</u>	<u>Depth</u>	<u>WO<sub>3</sub>(%)</u>	<u>Sn(%)</u>
Aberfoyle	2L	0.2	0.5
	9L	0.4	0.5
Storeys Creek	3L	0.8	0.05
	8L	1.0	0.02
Lutwyche	13L	0.7	0.2

The mineralised veins only occur in the Mathinna Beds within the 600m-wide weak contact aureole around the granite. The Aberfoyle vein system was worked down to 336 m below surface and within 50m of the aplite. The vein system is at least 550m long and the veins occupy a zone from 60m wide at surface to over 150m wide at depth, although the individual veins at depth are fewer and thicker.

The aplitic cupolas under the mineralised veins are strongly greisenised and mineralised, with disseminations and veinlets of sulphides (arsenopyrite-chalcopyrite-sphalerite-molybdenite) as well as wolframite, cassiterite, scheelite, apatite and fluorite (Hellsten (1979)).

**RESOURCES:** Identified resources include :

1. LUTWYCHE VEIN. Total ore potential (Bogg 1980): 1.08 mmt at an in-situ grade of 0.9% Sn + WO<sub>3</sub> (9700 tonnes of contained tin + WO<sub>3</sub>).
2. TAILINGS. Accumulated jig tailings, heavy media float, and sand/slime residues from mining operations at both Storeys Creek and Aberfoyle are estimated as follows (Bogg 1980) :

Jig tailings and float : 875,000 tonnes @ 0.12% Sn + WO<sub>3</sub> + sulphides.

Sand/slime residues : 223,000 tonnes @ 0.31% Sn + 0.29% WO<sub>3</sub> + sulphides (700t of contained Sn).

Bogg (1980) estimated that the Cu, Zn and Ag contents of the tailing and float material would have provided 63% of the revenue in any recovery project but actual grades for these metals were not quoted.

**POTENTIAL:** The fact that Aberfoyle Tin sold out with the Lutwyche vein system unmined and the nearby Kookaburra vein system largely unexplored, is clear testimony to the unattractiveness of low-production, high-cost narrow vein mining operations under modern economic conditions. In any assessment of the areas' potential these types of deposits can be disregarded.

Assessing the remaining potential of the mineralised systems in the Aberfoyle-Storeys Creek area is not straightforward. There is a lack of information on critical aspects. The important features of the resource potential are :

1. The vein systems actually comprise wide vein swarms that have possibilities for bulk low grade mining.
2. Insufficient attention has been paid to the significant sulphide contents of the systems, particularly the more-strongly sulphidic unmined Lutwyche system. The metals involved are Cu, Zn and Ag.
3. The highly greisenised and mineralised aplitic cupolas beneath the veins have potential for significant dispersed Sn-W-Cu-Zn-Ag-Mo mineralisation. The possibility exists for shallowly-buried mineralised cupolas in areas where the Mathinna Beds have been largely eroded off.
4. The overall style of mineralisation is similar to the Foley Zone at Cleveland.

1. The Vein Swarms

In geological terms, the vein systems are in fact mineralised vein swarms of substantial width (the Aberfoyle system is over 60m wide

and the Lutwyche system 75m wide). If the systems were discovered today they would undoubtedly be looked at as bulk mining propositions, taking the entire vein swarm and not just the two or three major veins within it.

Assessing the potential for bulk mining in the remaining mineralisation is difficult, due to the fact that previous exploration and mining so concentrated on the major veins that there is a lack of information on the swarm of smaller veins around them. A good example of this is the unmined Lutwyche system for which reserves are known for the main vein, but almost nothing is reported on the rest of the 75m wide vein swarm. It can only be assumed that the bulk mining potential of Lutwyche was not assessed.

In 1982 Rossarden Mines put a hole through the upper part of the Lutwyche system. Summons (1983) describes it as "an intensely veined zone of quartz stringers typically <100mm and averaging 5-10mm in width", the whole zone having an approximate true width of 75m. As the Lutwyche system is known over a length of 500m and to depths of over 300m, the potential bulk mineable tonnage here is considerable.

In 1980, a 1895 tonne parcel of supposedly unmineralised 'mullock' from the Brandon Shaft at the southern end of the Aberfoyle vein system was found to contain 0.92% Sn and 0.16%  $WO_3$  (McGushin & Keyes 1980). This development material came from a 245m long drive on 4 level (120m below surface) between Brandon Shaft and Spiers Shaft to the north. This led to investigations of the zone south of Brandon Shaft where the Aberfoyle vein system was found to consist of an intense, tightly sheeted swarm of mineralised 50-100mm wide quartz veins, in an unmined zone 200m long by 60m wide and extending to at least 120m depth. This zone was estimated to contain up to 12,900 tonnes of contained tin +  $WO_3$  in 5.16 million tonnes of potentially open-cuttable ore with a grade of between 0.15-0.25% Sn+ $WO_3$  (McGushin and Keyes 1980).

Subsequent calculations by M.L. Houston and K.G. Palmer of Aberfoyle (Houston 1980), suggested that a larger opencut centred on the Brandon Shaft and containing 12 million tonnes of ore with a head grade of 0.25% Sn +  $WO_3$  (30,000 tonnes of contained tin +  $WO_3$ ), was feasible and would be economically viable at the then present tin price of A\$13,000.

Seven percussion drillholes were subsequently put down into the potential ore block to test the validity of the tonnage and grade assumptions. Although the author could find no statement of the results of this drilling, percussion drilling would be a totally inadequate test of a low-grade vein swarm, which calls for large-diameter diamond drilling using special methods of core recovery and careful sampling. The 16 diamond drillholes recommended by McGushin and Keyes (1980) were not drilled.

Three additional factors which affect the economics of this bulk low-grade concept are worth noting :

- a. The veins contain Cu, Zn and Ag mineralisation as well as Sn and W. (This was not taken into account by Houston & Palmer, or McGushin & Keyes).
- b. The quartz veins often have micaceous selvages and part reasonably readily from the sedimentary wall rock suggesting ore-sorting prior to milling may be feasible. Sorting by sizing alone was effectively used in the Aberfoyle mill to upgrade the ore (the wallrocks forming larger lumps than the fractured quartz veins), but photometric sorting could also be possible. (Sorting was taken into account by Houston & Palmer and McGushin & Keyes, in their feasibility calculations).
- c. There is up to 18m thickness of Permian sediments overlying the southern end of the Aberfoyle vein system.

Apart from the Lutwyche and Aberfoyle vein systems the poorly explored Kookaburra vein system which lies between the other two, is also a potential target for a bulk low-grade deposit. All the veins lie in a corridor 1300m long and up to 600m wide.

## 2. Sulphide Potential (Cu, Zn, Ag)

Bogg (1980) of Aberfoyle Tin Ltd. comments: "It is clear that insufficient study has been given to maximum sulphides extraction in the past and with the further information gained from the trial milling of 1000t of Lutwyche ore in 1979, viz: that it was twice as rich in sulphides as normal Aberfoyle/Storeys Creek ore, increased study is essential. There is a lack of factual data on sulphide metallurgy at Aberfoyle".

The author could find no data on the Cu, Zn and Ag contents of the raw ore, and these metals were not mentioned in ore reserve calculations. However, in the final decade of mining 425t of mixed sulphide concentrates was produced annually, grading 4% Cu, 13% Zn, 466 g/t Ag and 0.6% Pb.

## 3. Mineralised Aplitic Cupolas

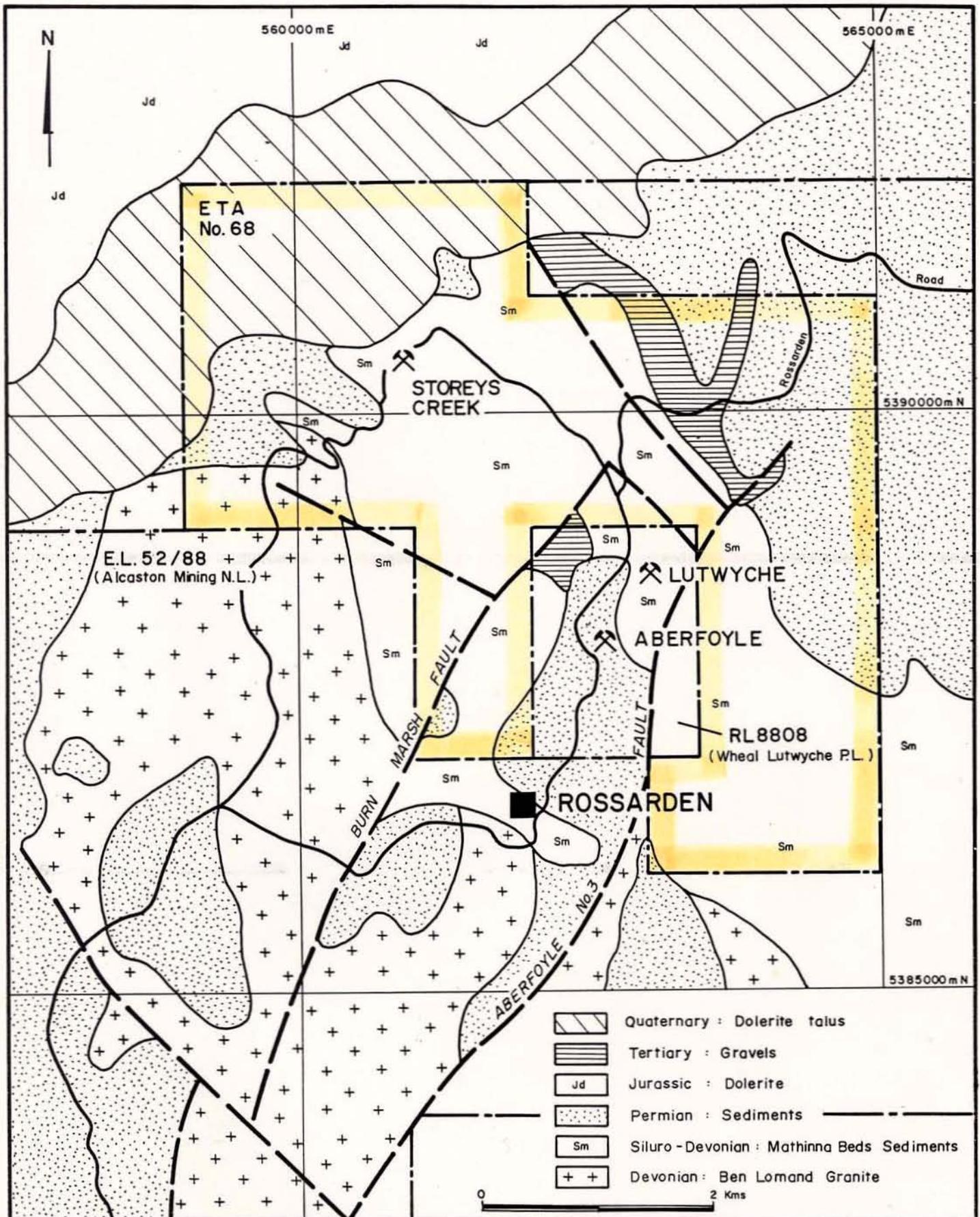
From the description by Hellsten (1979) it is obvious the aplitic bodies beneath the vein systems are highly altered and significantly mineralised. The main veins apparently become uneconomic as they approach and enter the aplite, but whether the bulk grade of mineralisation within the aplite has ever been seriously assessed is open to doubt. Apart from Hellsten's description that the highly greisenised aplite hosts widespread disseminations and veins containing As-Mo-W-Sn-Zn-Cp, there is no information on which to accurately judge the tenor of the mineralisation.

The bottom levels of Spiers Shaft (Levels 11 and 13) cut through the aplite beneath the Aberfoyle vein system, so there should be some relevant data on the old level plans. Some of the underground drillholes also intersected the aplite - possibly the core still exists. Some research into the grade of mineralisation in the aplite is certainly warranted.

While the aplite below the Aberfoyle system may be too deep (it is over 300m below surface) to be an exploration target, such mineralised cupolas may exist closer to surface. The Ben Lomond Granite outcrops only 1.5 km SW of the Aberfoyle Mine. Areas of shallowly-buried granite still roofed by a thin cover of Mathinna Beds would be the places to look at, particularly those with vein systems even if these appear only weakly mineralised.

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# Aberfoyle Resources Limited

EXPLORATION DIVISION

## NORTH EAST TASMANIA ROSSARDEN AREA GEOLOGY

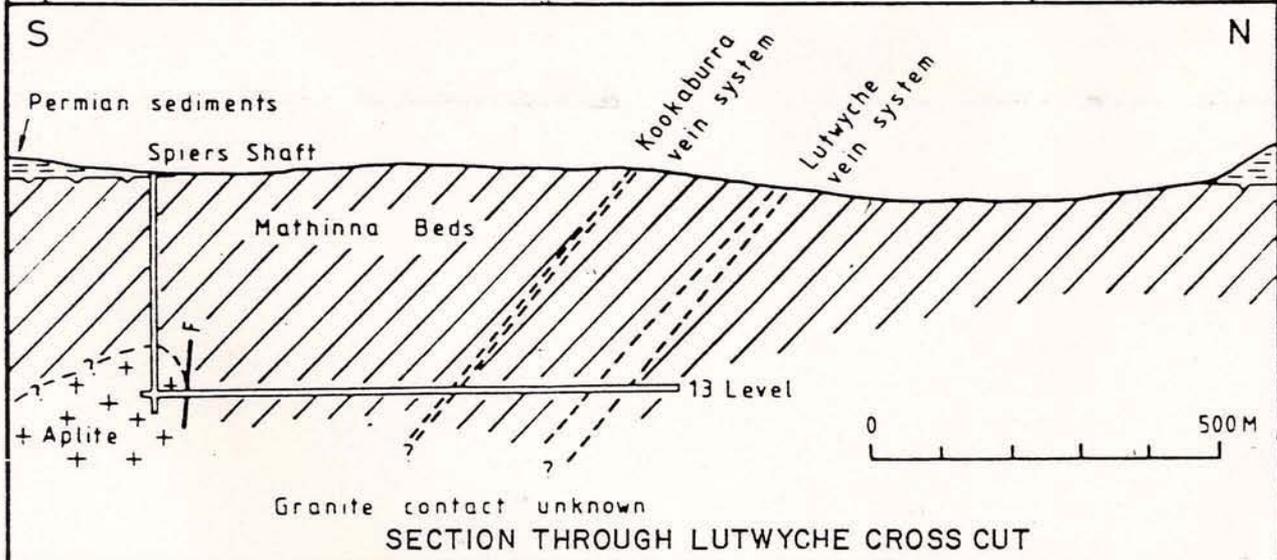
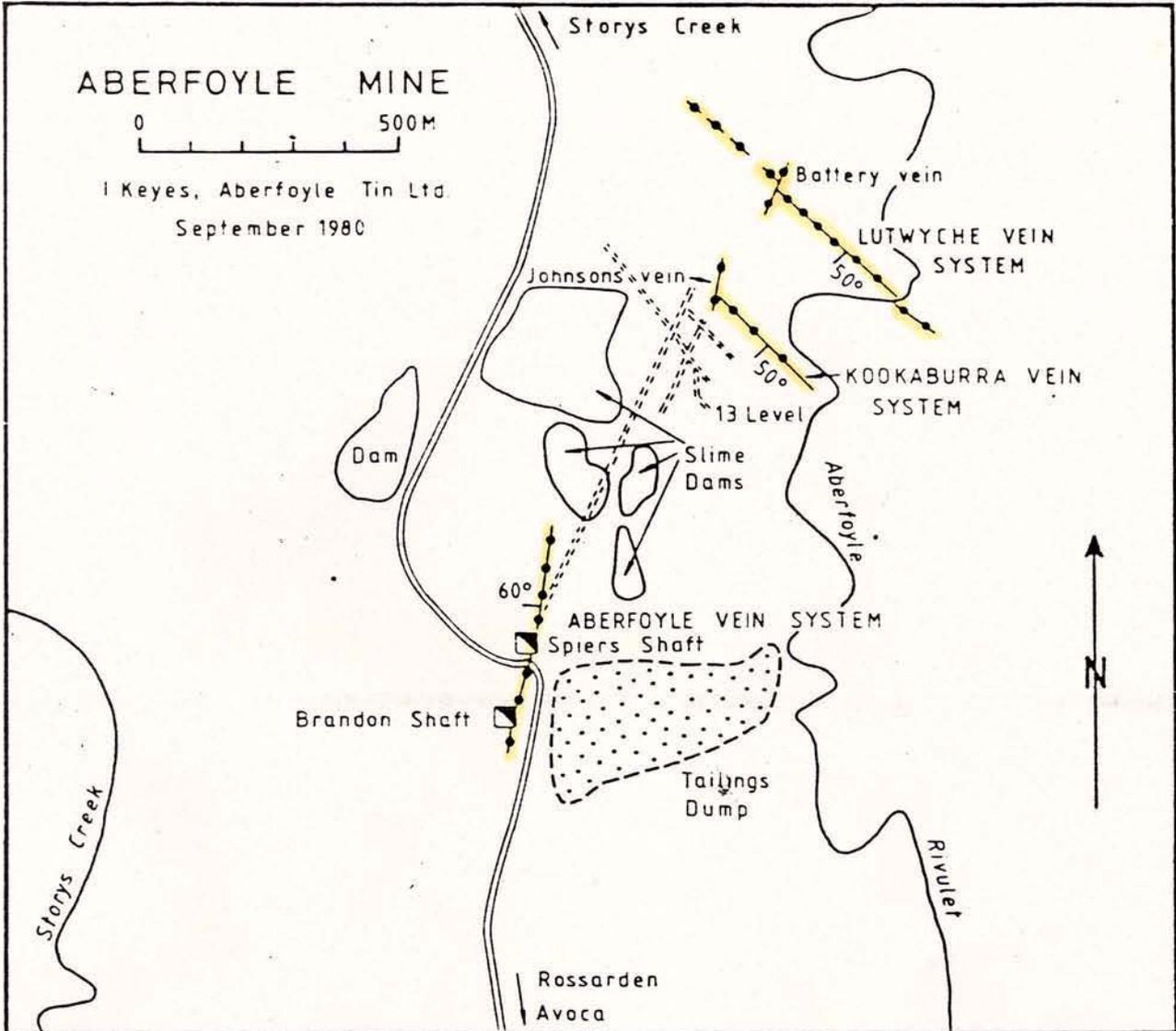
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 Plate No. : FIG 13

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Location Code :

Scale : As shown

Date : December, 1988



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NORTH EAST TASMANIA

**ABERFOYLE MINE AREA**

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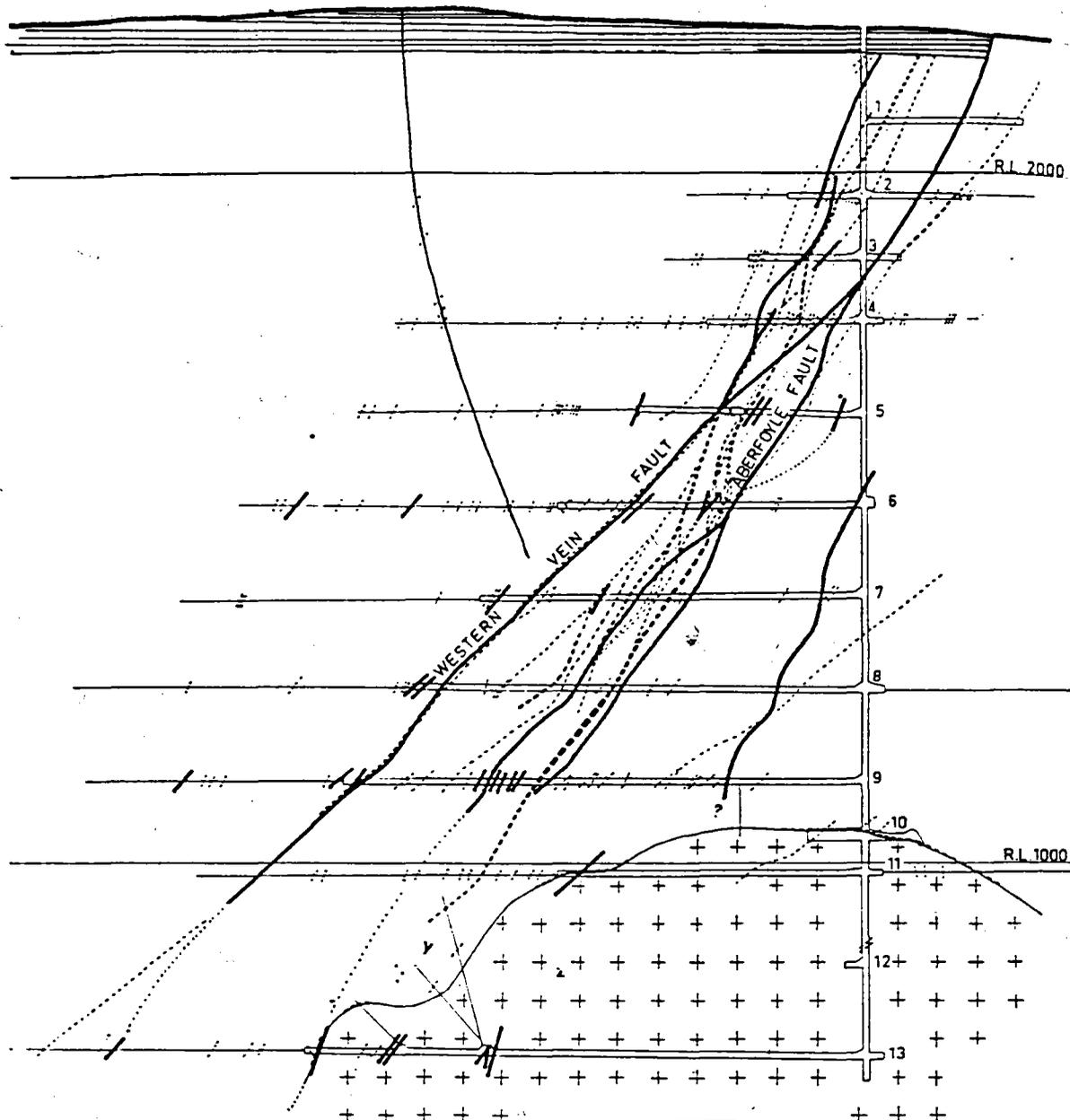
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Date : November, 1988

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SPIER'S SHAF 1



0 SCALE 100m

- Rock Boundary
- Fault
- Inferred Fault
- Quartz Vein
- Diamond Drill Hole

- PERMIAN
- DEVONIAN
- SILURIAN
- Mudstone
- Aplite
- MATHINNA GROUP
- Sub-greywacke
- Shales
- Quartzites

## Aberfoyle Resources Limited

EXPLORATION DIVISION

NORTH EAST TASMANIA

### CROSS SECTION OF THE ABERFOYLE MINE

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 Drawn : after Aberfoyle  
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 Plate No. : FIG 15

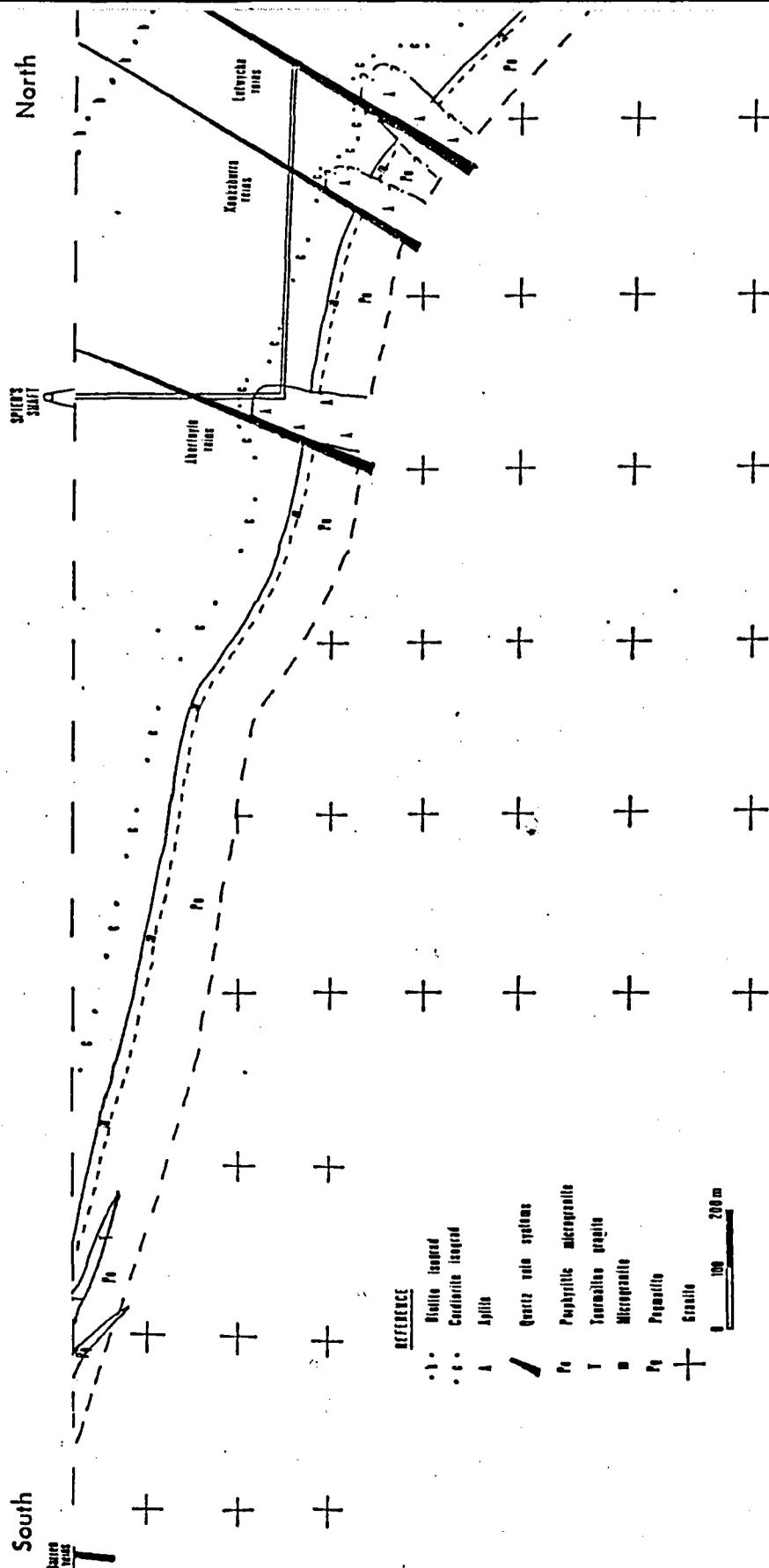
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Scale : As shown

Date : November, 1988

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**Aberfoyle Resources Limited**  
EXPLORATION DIVISION

NORTH EAST TASMANIA

**Interpreted Cross - Section of the Ben Lomond  
Granite & Assoc. Contact Aureole along  
Storey's Creek to Aberfoyle & Lutwyche**

Compiled : J. G. Purvis

Drawn : from Hellsten 1979

Traced :

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Plate No. : FIG 16

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Scale : As shown

Date : November , 1988

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### 5.5 MT. PARIS MASS

**LOCATION:** The Mt. Paris Tinfield lies to the south of the small towns of Branxholm and Derby in N.E. Tasmania, and immediately west of the Blue Tier Tinfield. The area is rugged, extending to just over 900m elevation at Rattler Hill. It is traversed by numerous forestry tracks.

**TENURE:** The area is currently vacant ground. Some of the known tin occurrences are covered by small inactive Mineral Leases held by individuals.

**STYLE OF MINERALISATION:** Mineralisation is basically of the same endogranitic styles as found in the adjacent Blue Tier Tinfield. The numerous tin occurrences are of three principal types :

1. Quartz-greisen veins.
2. Steeply-dipping greisen lodes surrounded by weakly stanniferous argillised granite.
3. Flat lying greisen sheets.

All mineralisation is associated with the undulating roof of the granite intrusion at or close to the contact with overlying Mathinna Beds sediments. The intensity of mineralisation and greisenisation within the granite declines rapidly with depth and the bulk of it lies within a few tens of metres of the contact.

The quartz-greisen veins contain coarse cassiterite with sulphides (cp, sp, py, aspy), silver and traces of wolframite and uranium. Occasionally, thin veins occur in the Mathinna Beds directly above granite. At RATTLER HILL, a quartz-greisen vein swarm exists in the granite over an area of 300m x 100m (Young 1981).

The near-vertical quartz-muscovite greisen lodes with their surrounding argillised granite halo are the most common style of mineralisation present. The argillised (kaolinised) material contains tin grades between 0.025 - 0.1% and was extensively sluiced by the old miners. The siliceous lodes are better, if erratically, mineralised but being harder required crushing before treatment and thus were largely ignored by the miners. These lodes are generally <2m wide, comprise granular greisen or greisenised granite, and formed when mineralised fluids were channelled into late-stage fractures at the margins of the granite intrusion, the fractures being essentially normal to the granite/sediment contact. There is a noticeable lack of true veining associated with this style of mineralisation (Taylor & Rubenach 1981). See Figure 18.

Flat-lying quartz-muscovite greisen sheets, formed by ponding of mineralised fluids in cupolas beneath the Mathinna Bed contact at the roof of the granite intrusion (as at the Anchor Mine on the Blue Tier),

are only known immediately west of RATTLER HILL (Young 1981), at the STAR OF PEACE workings in the same area (Purvis 1977), and at the MT. PARIS workings (Taylor & Rubenach 1981). See Figure 17.

**GEOLOGY:** The Mt. Paris Mass is a large alkali-granite intrusion of Upper Devonian age and part of the Blue Tier Batholith. It has been directly correlated by Groves et al (1977) with the tin bearing alkali-granite of the Blue Tier Tinfield immediately to the east. The alkali-granite is predominantly an equigranular muscovite-biotite granite, with numerous local phases marked by varying grainsize and proportions of the micas. The southern portion of the granite is overlain by Siluro-Devonian Mathinna Beds - dirty micaceous quartzose sandstones and siltstones. Contact metamorphic effects in the sediments adjacent to the granite are quite minor. Locally, flat-lying thin pegmatite lenses are present on the contact.

**EXPLORATION AND MINING HISTORY:** Individually, none of the numerous old workings on the Mt. Paris Mass have produced significant quantities of tin. Total production from the field is not accurately known but is here estimated at less than 500 tonnes of tin, most from sluicing of argillised granite. However, cassiterite eroded from mineralisation within the Mt. Paris Mass has been the source for over 27,000 tonnes of alluvial tin mined in the Ringarooma River system a few kilometres north of the mass, including the largest individual mine - the Briseis at Derby which produced over 21,100 tonnes of tin.

Most of the mining on the Mt. Paris Mass took place prior to 1930, but there was minor persistent production by small syndicates of about 5 tonnes of tin annually until the price collapse in 1985.

Modern exploration efforts on the Mt. Paris Mass have been fragmentary and of limited scope, except for Newmont in 1978 who drilled 99 percussion holes to average depths of 20m in a search for buried greisens beneath areas of shallow Mathinna Beds cover. They particularly concentrated on the STAR OF PEACE area. Other drilling programmes were : Mines Dept. (1962) - 3 diamond drill holes beneath GUIDING STAR workings; Texins Development (1971) - 4 diamond holes along RATTLER-MAMMOTH LODE; and Union Corp. (1981) - 4 diamond drill holes and 2 percussion holes, in the vicinity of the MT. PARIS MINE (to test a small greisen-bearing cupola in which (reportedly) an old adit had intersected 24m averaging 0.4% Sn and an old rise 15m @ 0.57% Sn). None of these exploration programmes obtained any results of significance.

**RESOURCES:** There are no currently identified tin resources in the Mt. Paris Mass.

**POTENTIAL:** While the tenor of the known tin occurrences on the Mt. Paris Mass is demonstrably weak, two factors need to be considered :

1. Large quantities of tin have been eroded from mineralisation in the Mt. Paris Mass. When this material is taken into account the mass has actually produced more tin than any other field or district in N.E. Tasmania.
2. The Mt. Paris Mass is poorly explored. There has never been a comprehensive programme with extensive drilling, of the type Renison conducted on the Blue Tier.

The inference from the large quantities of eroded tin is that extensive tin mineralisation should be present in uneroded granite beneath the Mathinna Beds cover over the southern portion of the intrusion. As the obvious exploration target would be open-cuttable low-grade greisen sheets of Anchor type, ponded beneath cupolas and other traps at or near the top of the granite, only areas of very thin Mathinna Beds cover would be prospective.

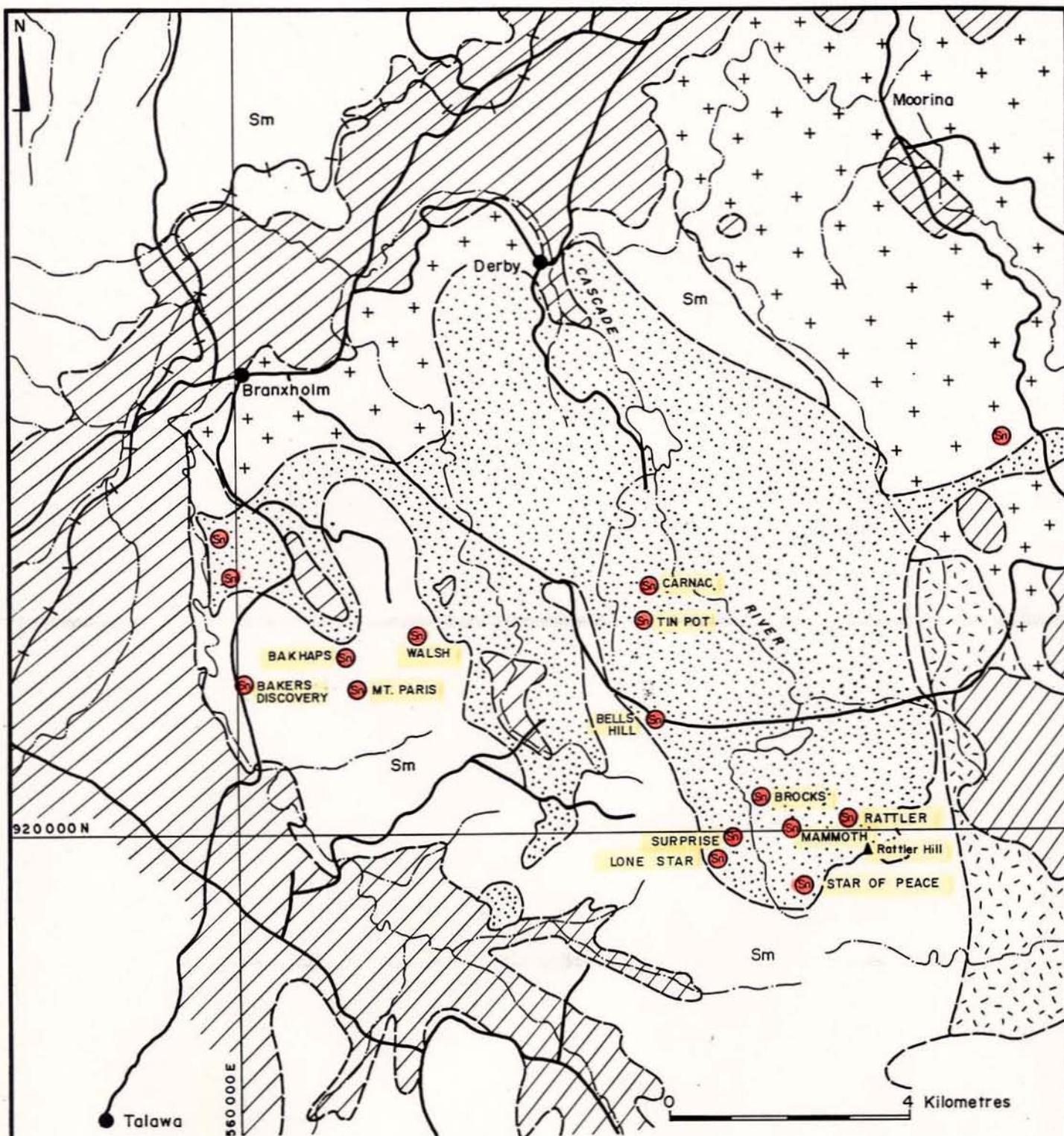
The RATTLER HILL area, which is at the apex of the intrusion, is clearly an area with tin potential. Young (1981) states: "To a great extent the present topography reflects the original form of the granite and relatively recent exhumation of a very high level apophysis is indicated" (at RATTLER HILL). In many tin granites the highest grade mineralisation occurs in the main cupola apex, which often is also the first part to be eroded off. In the Mt. Paris Mass this cupola is only partly exposed.

In 1981, Aberfoyle mapping and sampling outlined an exposed greisen body covering 150m x 100m and with an apparent grade of 0.32% Sn, immediately west of RATTLER HILL (Young 1981). Although drilling was recommended this was not done. Union Corp. (Winnall 1980) also mention an "irregular mass of greisen .... containing a potential one million tonnes of ore" in the same general area.

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- Tertiary - Quaternary sediments & basalts
- Med. grained biotite granite (muscovite), greisenised granite & greisen veins.  
(Lottah Sheets, Mt. Paris Mass, Mt. William Mass, Mt. Cameran Sheets)
- Porphyritic biotite - adamellite
- Biotite hornblende granodiorite
- Mathinna Beds
- Sn Lodes

**Aberfoyle Resources Limited**  
EXPLORATION DIVISION

NORTH EAST TASMANIA

**GEOLOGY**  
**MT. PARIS MASS**

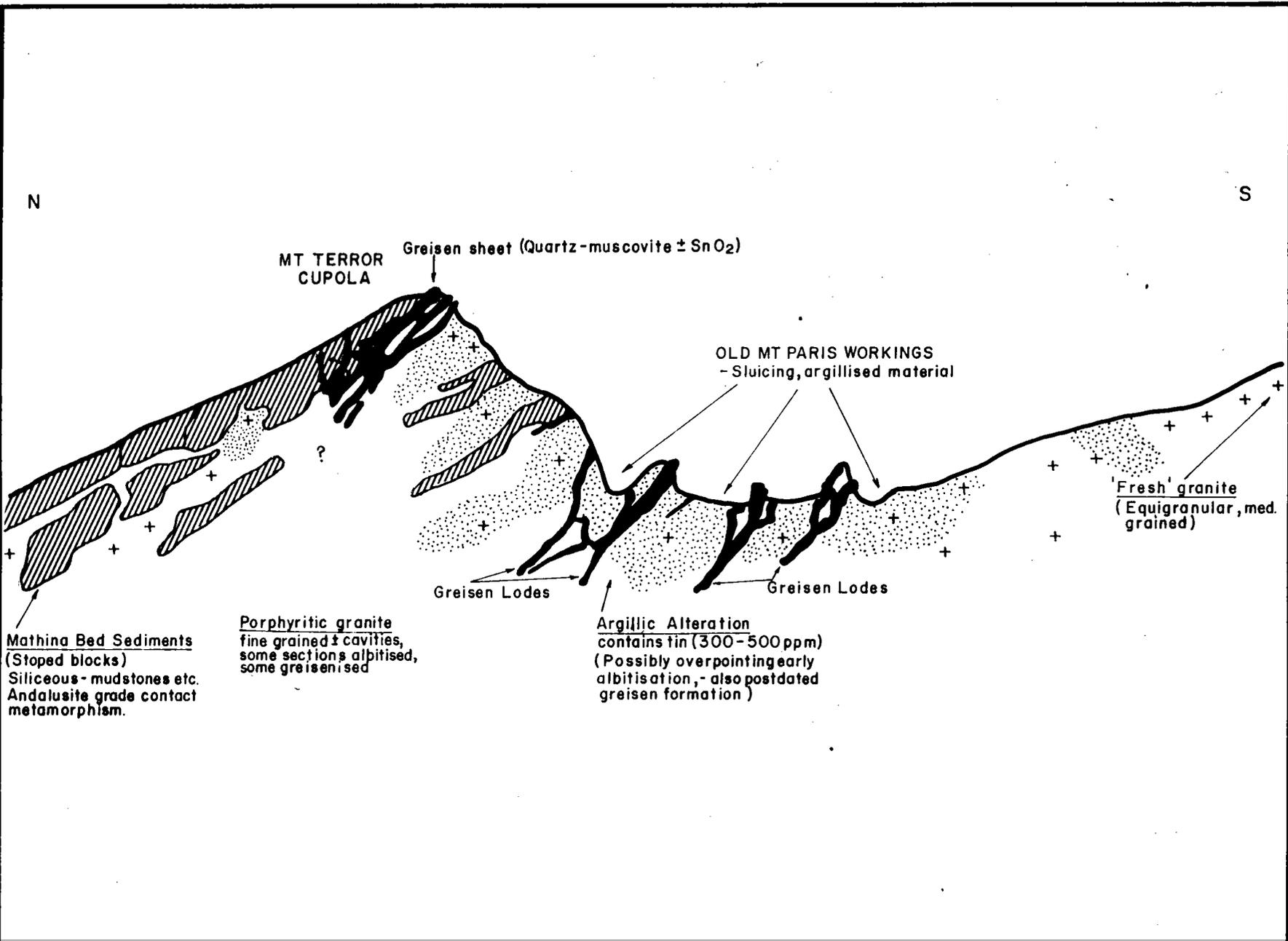
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 Plate No. : FIG 17

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Location Code :

Scale : As shown

Date : December, 1988



**Aberfoyle Resources Limited**  
EXPLORATION DIVISION

NORTH EAST TASMANIA

**MT PARIS TIN WORKINGS**

DIAGRAMMATIC INTERPRETATION OF MINERALISATION STYLES

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Location Code :

Scale : As shown

Date : November, 1988

Compiled : J.G. Purvis

Drawn : after Taylor et al, 1981

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Plate No. : FIG 18

After Taylor & Rubenach, 1981

## 5.6 ALLUVIAL PROSPECTS

**LOCATION:** Alluvial tin deposits occur in the drainage basin of the Ringarooma River in the NE corner of Tasmania, between the town of Branxholm and the sea at Ringarooma Bay. The area is low-lying and includes farmland and marshes.

**TENURE:** The on-shore areas of best large-scale dredging potential, in the lower reaches of the Ringarooma River system, are held under a series of Retention Licences by Triako Mines NL (RL 872 at Great Northern Plain), and Hellyer Mining & Exploration - a division of Santos (RL's 8715 and 8723 at Fosters Marshes). Adjacent areas with potential in this northern area are held under EL's (see Figure 2).

The off-shore area with potential, the eastern half of Ringarooma Bay, is held by Mineral Holdings Pty. Ltd. under EL 92/87. The upper half of the Ringarooma River system which historically was the best producing area, is free of title except for Retention Licence 871 held by Triako over the Pioneer workings. This picture is clouded by numerous small ML's situated over old workings.

**MINING HISTORY:** Approximately 44,500 tonnes of tin have been produced from the Ringarooma system since mining began in the 1870's. Working has been by sluicing and dredging. The bulk of production occurred prior to 1930 and there has been a steady decline since. The last major mines (Pioneer and Endurance) closed in 1982-83 and production has since ceased completely.

The field's major producer was the Briseis Mine at Derby which produced 21,140t Sn, followed by the Pioneer Mine at Pioneer (9750t Sn), Endurance Mine at South Mt. Cameron (3,500t Sn), the Dorset dredge (2,300t Sn), and the Arba Mine at Branxholm (2,300t Sn). Although there were countless smaller producers none of them produced >1000t Sn.

**GEOLOGY:** The Ringarooma River system drains northwards from the tin-bearing Devonian alkali-granites of the Mt. Paris Mass and Blue Tier Tinfield. During Tertiary times, subsidence formed a land-locked lacustrine basin in the upper part of the Ringarooma River system south of the granitic Mt. Cameron Massif. At the same time, erosion exposed the mineralised roof zones of the alkali-granites immediately south of the basin.

Tributary rivers entering the basin along its south-eastern margin formed fluvial cones of the cassiterite-bearing granite-derived detritus, at the break in slope between their steeper upper courses and the flatter gradient in the basin. These rich tin deposits were buried beneath later detritus and, in places, sheets of Tertiary basalt. The deep leads were later exhumed by the present river and each lead formed the basis of the more-important mines (see Figure 19).

To the north of Mt. Cameron several major basins formed during the early Tertiary, the most important being in the lower reaches of the Ringarooma River (the Great Northern Plains Basin) and in the lower reaches of the Boobyalla River (the Boobyalla Basin). These basins filled with fluvial, estuarine and shallow marine sediments, mainly derived from tin-bearing granitic detritus as well as some gold-bearing Mathinna Beds detritus, brought down by the Ringarooma and Boobyalla rivers.

Subsidence in the basins ceased in the Late Tertiary and was followed by extrusion of basalt sheets. Uplift in the Quaternary led to erosion of the basalt and reworking of some of the Tertiary alluvial tin into younger deposits along the present drainage channels.

The northern basin deposits are more extensive but much lower grade, than those in the upper basin where the vast bulk of production has been to date.

**RECENT EXPLORATION HISTORY:** Although there has been almost no exploration activity on the N.E. alluvials since the tin price collapse in 1985, the previous 20 years had seen extensive evaluation and drilling. This included programmes by many major companies who mainly targetted the Great Northern Plain area for its large-scale dredging potential. Programmes here were conducted by Dorset Tin, RTAE, Utah, BHP, Mines Dept., Wanex, Preussaq and Santos. The Santos programme (1981-83) was particularly comprehensive and provides the best assessment of this area.

In the upper basin, much work was carried out by Amdex (a division of Triako Mines NL and owners of the now-closed Pioneer and Endurance mines), especially in the period 1978-1985. Amdex were joined in JV by Anglo American from 1981-85.

The offshore tin potential in Ringarooma Bay was tested by Ocean Mining AG in 1965-66, who drilled 138 shallow holes into the sea floor after bathymetric and seismic surveys had indicated the presence of a drowned channel of the Ringarooma River. Although the offshore area has been held under EL's by several parties since (including CRAE 1980-83), no further drilling has been carried out.

**RESOURCES:** See Table 3.

**ACCESSORY MINERALS** There were significant amounts of ilmenite, zircon, monazite, gold, and to a lesser extent rutile, in some of the worked deposits although these were largely ignored by the tin miners. There is almost no data on which to judge the average grade of such minerals in the deposits.

The Dorset dredge reportedly produced 6935 oz of gold (Bowen 1980), and the Pioneer and Endurance mines together produced about 30 oz of gold annually. There is more gold in the younger river channel deposits than in the Tertiary deep leads.

TABLE 3

N.E. TASMANIAN ALLUVIAL TIN RESOURCES

A. IDENTIFIED RESOURCES				
Location	Volume (million m <sup>3</sup> )	Grade (g Sn/m <sup>3</sup> )	Contained Tin (t)	Comments
<u>A. Upper Basin:</u>				
Arba Deep Lead	7.3	262	1910	20m of basalt cover. Amdex estimate (Newton-Smith 1981).
Cascade Deep Lead	6.95	178	1235	50m of basalt cover. (King 1963).
Pioneer Deep Lead	5.09	196	1000	Proven reserves, Amdex 1980 (Newton-Smith 1981), less 1981-82 production.
Endurance Deep Lead	5.21	215	1120	Probable reserves, Amdex 1980 (Newton-Smith 1981), less 1981-82 production.
<u>B. Great Northern Plains Basin:</u>				
Braithwaite's Area - E of Fosters Marsh	6.16	136	835	Av depth 14m. Mines Dept. drilling (Braithwaite 1977).
Fosters Marsh	19.38	99	1920	Av depth 19m. Santos drilling (Lee 1983).
Scoloch Lead	8.41	133	1120	Narrow deep channel deposit with gold values. Mines Dept. drilling (Dunne 1978).
Mac Gregors Lead	3.8	83	315	1972 Wanex drilling (Lee 1983).
<u>C. Boobyalla Basin:</u>				
Dugards	1.31	83	110	1966 Utah drilling (Lee 1983).
Monarch Lead	2.44	208	510	Possible reserves, Amdex 1980 (Newton-Smith 1981).
			TOTAL: 10,075	
B. POTENTIAL RESOURCES				
Delta/Dugards, Boobyalla Basin	23	84	1930	Estimate by CRAE (Toh 1978).
Great Northern Plain - all areas	76.5	103	7880	Total identified + potential reserves. Estimate by Santos (Lee 1983).
Ringarooma Bay - offshore	21.27	174	3725	Maximum inferred reserves at 75g Sn/m <sup>3</sup> cut-off. Estimate by CRAE (Clementson 1981).

There is abundant ilmenite and monazite in some of the upper basin deep leads. Morrison (1981) found monazite comprises 6% of the HM content at Pioneer, with ilmenite 28% and zircon 3.4%. He noted monazite was most abundant in the Endurance-Pioneer area, and each produced some 30-40t of monazite during World War II. There are no mentions of monazite in the Great Northern Plain deposits although ilmenite, gold, zircon and rutile are present.

**POTENTIAL:** The volume of data on the N.E. Tasmanian tin alluvials is enormous and a comprehensive evaluation of the potential is beyond the scope of this report. The broad outline of the situation is readily apparent.

On-shore there are low-grade potentially-dredgeable tin deposits in the Great Northern Plains and Boobyalla basins. The indications are that these deposits are individually less than 25 million m<sup>3</sup>, aggregate up to 100 million m<sup>3</sup>, and have an average grade around 100g Sn/m<sup>3</sup>. The potential here thus totals around 10,000 tonnes of contained tin. The deposits contain minor, but economically important, amounts of gold, ilmenite, zircon and rutile.

Santos (Lee 1983), in their excellent summary report on the Great Northern Plains area, estimated the total potential resource at 76.5 million m<sup>3</sup> grading 103g Sn/m<sup>3</sup>. This resource occurs in several separate blocks on a single blanket-like Quaternary gravel layer containing irregularly-distributed cassiterite concentrations. It extends north-west along the eastern side of the Ringarooma River from Mac Gregor's workings to Bowlers Lagoon - a distance of 6 km. Santos concluded "the prospect represents an excellent dredging proposition if adequate reserves can be located" (Lee 1983). The tin price at that time was \$A13,000/tonne.

However, there are problems relating to land use and tenure in these northern Tertiary basins. Much of the Great Northern Plain is listed in the Register of the National Estate and a substantial portion of the potential dredging zone is privately owned land with mineral rights vested in the owner. It was as much for these reasons, as for the falling tin price, that Santos stopped exploration in 1983 and accepted the Government's offer of a Retention Licence over the deposits.

In the upper basin south of Mt. Cameron the deposits are smaller but higher grade. Problems here related to depth of overburden (which stopped the old mines), and the fact that some of the resources lie under private farmland. Over 5000 tonnes of contained tin have been identified by drilling in the known extensions of the Arba, Cascade, Pioneer and Endurance deep leads. Monazite would be an economically-important accessory, along with ilmenite, zircon and gold.

For the combination of both potential resource size and absence of environmental/land use problems, the drowned channel deposit on the sea floor in the eastern part of Ringarooma Bay appears to be the most attractive alluvial tin deposit in NE Tasmania.

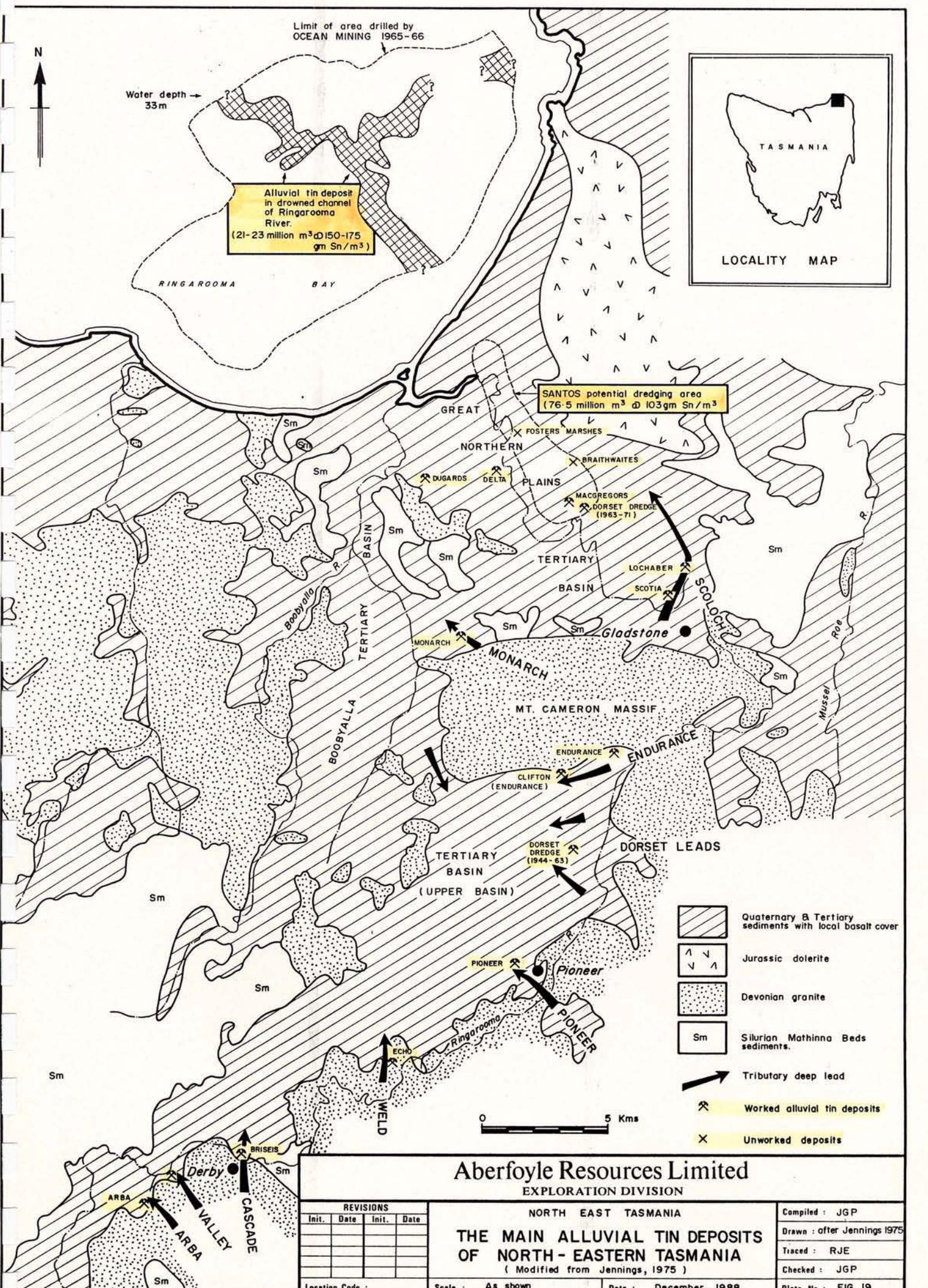
The indicated grade at 150-175g Sn/m<sup>3</sup> is significantly higher than in the dredgeable on-shore areas. The indicated volume figure (21-23 million m<sup>3</sup>) is highly unreliable and probably much too low. It is limited by the reconnaissance nature of the drilling (only 15 holes intersected the deposit over an area of 11.5 km<sup>2</sup>), the fact that the drill holes only penetrated 5-6m into the seabed, and the fact that drilling was limited to a maximum water depth of 33m with the deposit being left open to the north. The value of the likely accessory minerals (ilmenite, zircon, rutile and gold) has also not been assessed.

The Ringarooma Bay deposit has not been tested since the initial drilling in 1965-66. Of all the NE alluvial tin deposits it appears to most warrant further investigation.

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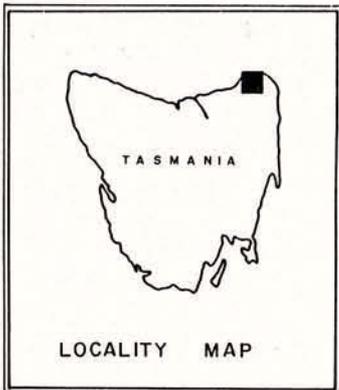
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Limit of area drilled by  
OCEAN MINING 1965-66

Water depth  
33m

Alluvial tin deposit  
in drowned channel  
of Ringarooma  
River.  
(21-23 million m<sup>3</sup> @ 150-175  
gm Sn/m<sup>3</sup>)



SANTOS potential dredging area  
(76.5 million m<sup>3</sup> @ 103gm Sn/m<sup>3</sup>)

-  Quaternary & Tertiary sediments with local basalt cover
-  Jurassic dolerite
-  Devonian granite
-  Silurian Mathinna Beds sediments.
-  Tributary deep lead
-  Worked alluvial tin deposits
-  Unworked deposits

0 5 Kms

**Aberfoyle Resources Limited**  
EXPLORATION DIVISION

NORTH EAST TASMANIA

**THE MAIN ALLUVIAL TIN DEPOSITS  
OF NORTH - EASTERN TASMANIA**  
( Modified from Jennings, 1975 )

REVISIONS			
Init.	Date	Init.	Date

Compiled :	JGP
Drawn :	after Jennings 1975
Traced :	RJE
Checked :	JGP
Plate No. :	FIG 19

Location Code :      Scale : As shown      Date : December, 1988